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ABSTRACT

In May 1983 the California State University (CSU) introduced the Entry-Level Mathematics (ELM) examination as part of its basic skills assessment process for first-time freshmen and undergraduate transfers. The exam is intended to provide students and counselors with information on the levels of mathematical competency possessed by entering students. For any student who is not exempt from the testing program, a satisfactory score on the exam is a prerequisite for enrollment in any course which satisfies the quantitative reasoning requirement of the CSU General Education-Breadth program. The ELM exam is a multiple-choice test with 65 questions, of which 60 items are scored. There are approximately 12 questions covering arithmetic, 36 questions in elementary algebra skills, and 12 questions in geometric measurements. This report offers an overview of the first year of the testing program. It provides background on the history, nature, and purpose of the ELM exam generally; reviews procedures and data related to test development, administration, performance, and evaluation; and discusses some of the broader implications of the testing program. Extensive appendices offer more detailed information on issues or data mentioned in the text. (LMO)

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THE

ENTRY LEVEL MATHEMATICS

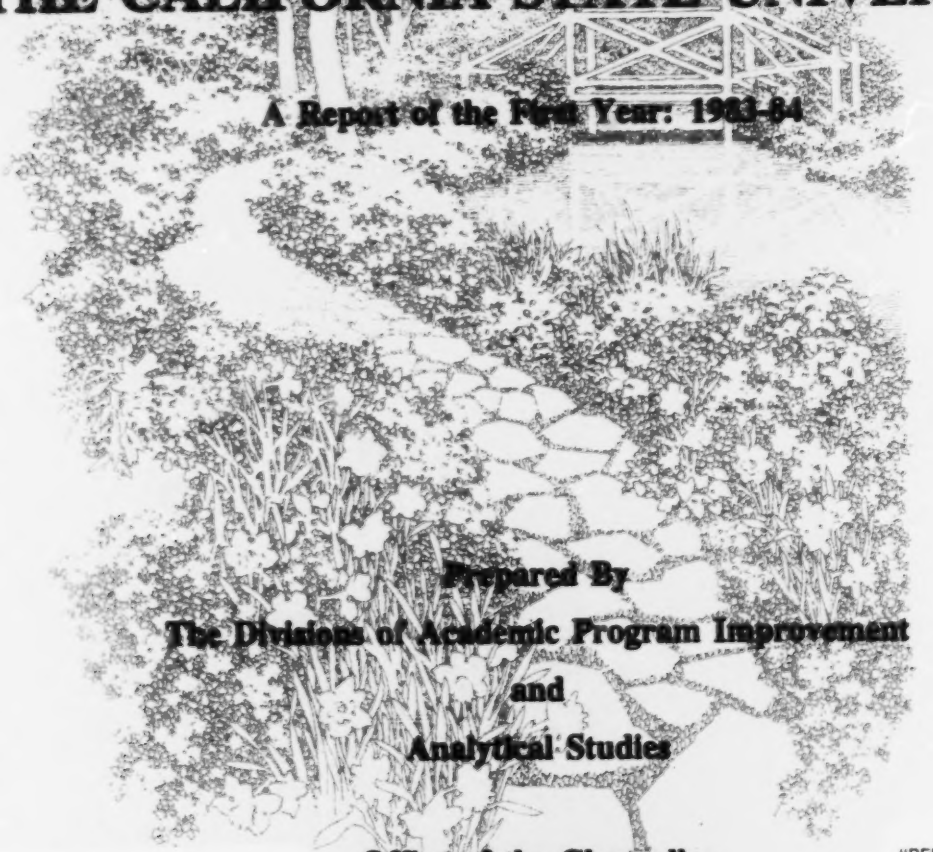
(ELM)

EXAMINATION

IN

THE CALIFORNIA STATE UNIVERSITY

A Report of the First Year: 1983-84



Prepared By

The Divisions of Academic Program Improvement

and

Analytical Studies

Office of the Chancellor

March 1985

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I. BACKGROUND

In May 1983 The California State University introduced the Entry-Level Mathematics (ELM) examination as part of its basic skills assessment process for first-time freshmen and undergraduate transfers. The exam is intended to provide students and counselors with information on the levels of mathematical competency possessed by entering students. For any student who is not exempt from the testing program, a satisfactory score on the exam is a prerequisite to enrollment in any course which satisfies the quantitative reasoning requirement of the CSU General Education-Breadth program.

This report offers an overview of the first year of the testing program. It provides background on the history, nature, and purpose of the ELM exam generally; reviews procedures and data related to test development, administration, performance, and evaluation; and discusses some of the broader implications of the testing program. A series of appendices offers more detailed information on issues or data mentioned in the text.

A Brief History of the ELM Examination

In 1980 The California State University made changes in its General Education requirements stipulating that all students complete at least one course in quantitative reasoning in order to earn a baccalaureate degree. To assure that such a course, usually in mathematics, is taught at a level appropriate for university study, students need to have a minimum level of competence in mathematical skills before enrolling in the class. Consequently, Title 5, California Administrative Code, Section 40405, was amended to stipulate that each student admitted to the CSU is expected to possess basic competence in the English language and mathematical computation to the degree that such competence may be reasonably expected of entering college students.

Also in 1980, Executive Order 338 (General Education-Breadth Requirements) was issued requiring that each campus determine appropriate entry-level skills for English language and mathematical computation and institute means for determining whether new students possess such skills. The chairs of the mathematics departments of the CSU campuses considered this problem and recommended that a systemwide policy be developed on entry-level skills and that it be applied uniformly throughout the system. They recommended that an examination be developed to evaluate student entry-level skills in mathematics, that the examination be given on all campuses of the CSU, and that a standard level of achievement be applied on all campuses. This systemwide approach received the support of faculty and administration on the campuses as well as of the Statewide Academic Senate (Appendix 1).

In order to develop and implement a systemwide policy on entry-level mathematics skills, the Vice Chancellor of Academic Affairs appointed a Task Force on Entry-Level Mathematics Skills. This group included faculty members from mathematics as well as the sciences, social sciences, humanities, business and education. In addition, there were representatives from campus Test Offices, Vice Presidents for Academic Affairs, and the Chancellor's Office (Appendix 2).

During the 1981-82 academic year, the Task Force met to deliberate its charge and make appropriate recommendations in its 1982 report. The group recommended that an examination be developed that would test students' skills in arithmetic, elementary algebra, and geometric measurements. They also recommended that students take the exam as soon as possible after being admitted to the university, that exemptions be allowed on the basis of satisfactory levels of performance on other standard exams, and that a demonstration of minimum competence in mathematics be a prerequisite to any CSU course that satisfies the General Education-Breadth requirement in quantitative reasoning (Appendix 3).

Also in its report, the Task Force expressed some concerns that are still valid today. First, students who are not planning to study in a field related to mathematics may not believe that the type of mathematics tested on the exam is necessary for them, may find the exam requirement a surprise, may not do well on the exam, and may need to enroll in remedial courses before passing the exam. Much of this was true to some extent at the beginning of the testing program. In talking with high school representatives, however, representatives of the CSU have made every effort to suggest that students should prepare for the exam, preferably by taking a mathematics course in their senior year of high school.

A second concern is for the opposite type of student, one who is interested in a field which requires extensive use of mathematics, and who would typically take four years of college preparatory mathematics in high school. It is important that such students realize that the mathematics tested on the examination represents minimal entry level skills and does not represent sufficient training in college preparatory mathematics for such fields. A related concern of the Task Force was that in setting minimum entry-level competencies, the CSU may give some high school teachers the impression that they only need to teach the topics covered on the examination in their college preparatory courses. Every effort has been made to dispel the possible misconceptions which give rise to these concerns.

A list of specifications which would be tested by the examination was developed and is given in Appendix 4. This list was distributed widely throughout the state.

Since 1977, the CSU and the University of California have had a joint workgroup which has been developing examinations to be used to improve placement of students into courses in intermediate algebra, precalculus, and calculus. This committee of faculty members from the two systems, the UC/CSU Mathematics Diagnostic Workgroup, was asked to write the first Entry-Level Mathematics (ELM) examination to be given to entering CSU students. As will be noted in the next section, the Task Force had determined that the exam would have 60 scored questions with a score of 38 correct questions needed to pass the exam. The first examination was pilot-tested at six CSU campuses as well as in several high schools. The ELM scores of students who pilot-tested the exam were compared with their scores on other standard exams such as the SAT and Advanced Placement exams. These results were used to determine scores on certain standard tests which would be used to exempt entering CSU students from taking the ELM exam (see Appendix 5).

Description of the ELM Exam

In determining the specifications which would be tested on the ELM exam, the Task Force was aware of the admission requirement which would take effect in the fall of 1984, whereby entering CSU students would be required to have two years of college preparatory mathematics. For most students, this would mean that they have had at least basic algebra (Algebra I) and geometry. However, there is a substantial number of high schools who believe that students should have basic algebra and intermediate algebra (Algebra II) before taking geometry. Consequently, students from such schools who have had only two years of college preparatory mathematics would not have had geometry. In order to test minimum competence with an examination that does not penalize students coming from either pattern mentioned above, it was decided that the ELM exam would have problems in arithmetic, basic algebra, a few questions from topics in a traditional high school geometry course, and a few which might come from a course in intermediate algebra. However, most of the questions in geometry concern geometric measurements, topics which are taught in upper elementary school and junior high school mathematics courses. In studying test results from the first year of the ELM exam testing program, it has been found that there is virtually no difference in total scores of students who have had only basic algebra and intermediate algebra from those who have had only basic algebra and geometry. (However, as will be noted later, students do much better on the exam if they have had all three courses, basic algebra, geometry, and intermediate algebra.)

The ELM exam is a multiple-choice test with 65 questions of which 60 items are scored. (The remaining five questions are being pretested for possible use in future ELM exams.) There are approximately 12 questions covering arithmetic, 36 questions in elementary algebra skills, and 12 questions in geometric measurements. With 75 minutes in which to work, most students are able to complete the exam.

The Task Force wanted students to be able to obtain correct answers on 9 of the 12 arithmetic questions (75 percent), 22 of the algebra questions (60 percent), and 7 of the 12 geometry questions (60 percent). Originally it was planned that a student should receive a passing score in each of the three areas in order to pass the exam. However, in pilot testing it was found that a

policy of requiring three passing scores would not produce a significantly different list of passing students than would be obtained by using a total score. Therefore, a student who has at least 38 of the 60 questions correct passes the exam.

When ELM exam scores are sent to the student and to the university, the total score is given, as well as subscores in five areas: arithmetic; polynominal functions and rational expressions; linear and quadratic equations; graphs, exponents, and square roots; and geometric measurement. Students and their advisors are able to see areas of strengths and of weaknesses. The student who does not pass the ELM exam is able to identify areas that need review before taking the exam again.

ELM Examination Development Committee

Following the writing of the first ELM exam by the UC/CSU Mathematics Diagnostic Test Workgroup, the test has gone through a process of review and change, and new forms continue to be developed. This is a task of the ELM Examination Development Committee, a group of six CSU faculty members (Appendix 6). The committee is assisted by the Director of the CSU Entry-Level Mathematics Project and by a representative from the Educational Testing Service (ETS). Except for the members of the first committee, some of whom had terms of one or two years, members of the committee are appointed to three-year terms. They are paid honoraria for their work by ETS.

Members of the ELM Examination Development Committee write problems for possible use on the ELM exam and then the problems are reviewed by the entire committee and by reviewers in ETS. When a question is pretested, an analysis is made of the number of students who get the correct answer, the capabilities of students who choose one of the distractors (to be sure that good students aren't "tricked" into choosing a bad distractor), and how the problem would affect the level of difficulty if that problem were to be used as one of the scored items in a future form of the ELM exam. In its semi-annual meetings, the ELM Examination Development Committee selects approximately 20 items on the current ELM exam to "retire," selects an equal number of pretested items to replace them, and chooses problems for pretesting. Careful attention is directed toward maintaining a constant level of difficulty from one form of the exam to another.

After a new form of the ELM exam has been assembled by the ELM Examination Development Committee, the exam is composed for printing by ETS and is proofread by members of the committee. After the copy has been approved, the exam is printed by ETS and distributed to campuses at the appropriate times for test administration.

II. THE FIRST YEAR

ELM Administration, 1983-84

Students Subject to the ELM Requirement

Undergraduate students entering the CSU beginning in 1983-84 who are subject to the 1983-84 or later campus catalog or bulletin are subject to the ELM requirement. That is, they must pass the ELM exam with a score of 38 or better as a prerequisite to completion of coursework which satisfies the quantitative reasoning requirement of the General Education program, unless they are exempt for one of the following reasons:

1. Scoring 3 or above on the Advanced Placement Mathematics examination (AB or BC).

2. Scoring 530 or above on the mathematics section of the Scholastic Aptitude Test (SAT-Math).

3. Scoring 23 or above on the ACT mathematics test.

4 Scoring 520 or above on the College Board Math Achievement Test, Level 1.

5. Scoring 540 or above on the College Board Math Achievement Test, Level 2.

6. Completion of a college course that satisfies the General Education-Breadth Requirement in Quantitative Reasoning provided it is at the level of intermediate algebra or above with a grade of C or better.

As noted earlier, test score exemptions are granted as a result of correlation studies made using results of the pilot testing. Coursework exemptions are the results of articulation agreements which allow transferring institutions to certify completion of General Education requirements (Appendix 7).

During the first year of its administration, the ELM examination requirement has applied largely to first-time freshmen, since they are subject to 1983-84 catalog requirements. Current transfer students tend to be subject to requirements of earlier catalogs or bulletins, unless campuses have instituted their own local testing requirements for such students.

The ELM examination program has a characteristic which makes it different from the CSU's other testing program for incoming students, the English Placement Test (EPT). While a student takes the EPT at most one time, a student who is required to take the ELM exam must pass it before enrolling in a quantitative reasoning course needed to complete the program in General Education. Therefore, an individual student may need to take the test several times before achieving a passing score.

Testing Schedule

As it is presently organized, the ELM examination is administered on dates in May, July, October, and January on each CSU campus. The first systemwide administration was conducted in May 1983 for students admitted for 1983-84. According to systemwide policy, campuses may conduct "demand" administrations, subject to Chancellor's Office approval, if they can demonstrate need to enforce student compliance or extenuating circumstances which make additional tests necessary. Approximately 10 percent of tests were administered as "demands" in 1983-84.

A "testing year" for the purposes of the ELM examination is defined as May through January. This reporting period is chosen for several reasons. First, the admitted students taking the test during these months are the most likely to enroll in the subject academic year. Second, using this time period assures that full year testing data are available soon after January and can be used for incorporation into the next systemwide

budgeting cycle, if necessary. Finally, it parallels the contract year for ELM administration and allows a double check on numbers tested annually as computed by the system and the testing contractor (agency hired to conduct administration). Demand tests occurring between January and the following May are reported with the May test data.

ELM Testing Contract

Under the terms of a Request for Proposals issued in 1983, testing firms were invited to compete for administration and scoring of the ELM exam as well as for reporting, analyzing, and maintaining records of test results. The contract for this program was awarded to the Western Regional Office of the Educational Testing Service in Berkeley.

Since the ELM exam is not supported through state budgetary appropriation, the student pays ETS directly a test fee of $7.00 for each time he/she takes the exam. Depending on the volume of students tested, a small portion of each student's fee is donated by ETS to an ELM Trust Fund designed to support activities and projects to improve student preparation in basic mathematics skills. In 1983-84, a net amount slightly in excess of $8,000 was donated to this fund, and the majority of this money was used to support ELM evaluation projects on the campuses. (These projects are described later in this report.)

Compliance with ELM Policy

In fall 1983, 25,443 first-time freshmen enrolled in the CSU. Of these, 12,355 had taken the test at least once by January 1984. In addition, 1,808 enrolled students who were either transfer students or returning students above the freshman level also took the test, bringing to 14,163 the total number of students tested who were entering or returning to the CSU. In figuring the level of compliance with system testing policy, the number of freshmen exempt from the test by virtue of SAT/ACT scores was deducted, leaving 17,556 subject to the requirement. This yields a compliance rate for freshmen during the period covered of approximately 70 percent.

As stated in Executive Order 416 (Appendix 5), students subject to the test who do not take it by the end of their first semester or second quarter of enrollment will be subject to administrative probation, which may lead to disqualification from future attendance. As campuses continue to monitor and enforce the policy, compliance rates are expected to increase. But monitoring future policy compliance will be complicated by additional factors. For example, as the program continues, two other groups of students subject to the requirement will increase in numbers. These are upper and lower division transfer students subject to the 1983-84 or subsequent campus catalog or bulletin, and students who have taken the test (several times, perhaps), but have not yet passed it.

Campuses confront additional problems in their efforts to satisfy the requirements of Executive Order 416. Since a student may not enroll in a course which satisfies the quantitative reasoning requirement unless that student has passed the ELM exam, campuses have found it necessary to develop systems which will monitor the registration of students in these courses. In the beginning of the program, this monitoring was done on almost all campuses "by hand," using lists of students and their ELM scores provided by ETS. As time goes on, this method becomes impractical, since no master list of test takers from all administrations is produced, and such a list would soon be too cumbersome to be useful. In general, campuses are working towards a computerized process, which will prevent a student from enrolling in a quantitative reasoning course if the ELM requirement has not been met.

Student Performance

This section will provide some statistical findings for the ELM exam scores recorded during the May 1983 through January 1984 testing year. The Division of Analytical Studies will publish a more detailed statistical analysis of the ELM data under separate cover.

In discussing the performance of CSU students on the ELM exam, it is important to keep in mind the effects of at least two factors on the population of test takers. First, students who have demonstrated competency in mathematics through other standard exams are exempt from taking the test. This means that the population of students required to take the test comprises those who may not be well prepared in mathematics. Second, not all students subject to the ELM requirement take the exam when they should. The effect of this latter factor on the ELM exam score distribution has not been studied.

In the 1983-84 testing year, the ELM exam was administered 22,179 times to 20,356 individuals. The rate of passing the exam (scoring 38 or above) varies by campus but can be averaged systemwide. For the

1983-84 year, the systemwide pass rate for all administrations was 47 percent. In general, pass rates are higher early in the testing year, i.e., students taking the test in May tend to pass at higher rates than those taking the test in July, October, or January. A summary of systemwide pass rates in 1983-84 systemwide administrations is as follows:

Test Date	Number Taking	Number Passing	Percent Passing
May 1983	3,069	1,785	58%
July 1983	7,815	4,100	52%
October 1983	5,349	2,084	39%
January 1984	3,858	1,376	36%
Demand Admin.	2,088	1,086	52%
Total	22,179	10,431	47%

As noted above, there were 20,356 individuals who took the ELM exam at least once. These individuals are referred to as First Time Test-takers (FTTs). Some of these FTTs took the ELM exam more than once, but only their first ELM exam score is used in these statistical studies. The entire group of FTTs includes some people who did not subsequently enroll in any campus of the CSU, some who were not freshmen but who were subject to the ELM requirement because they were entering under the conditions of the 1983-84 catalog, and some who were not required to take the exam but who did because of confusion about the requirement. The passing rates of FTTs on each campus are given in Appendix 8.

Performance of First Time Freshmen-First Time Test-takers

The largest group included in the FTTs were First Time Freshmen (FTF). In the results discussed in this report, this group will be referred to as First Time Freshmen-First Time Test-takers (FTF-FTTs). This group of 12,355 students makes an interesting group to study since they all came to CSU with minimal amounts of previous college experience, if any, and therefore form the best base for comparison studies available at this writing. The passing rates of FTF-FTTs on each campus are given in Appendix 8.

In comparing passing rates for FTF-FTTs to those of all FTTs it can be seen that the rates for FTF-FTTs are higher on each campus than the rates for all FTTs on that campus. Systemwide, there were 46.6 percent of all FTTs who passed the ELM exam while 52.2 percent of FTF-FTTs passed it.

FTF-FTTs	Number	Number Passing	Percent Passing
Male	4,625	2,707	58.5%
Female	7,730	3,739	48.4%
Total	12,355	6,446	52.2%

Women generally do less well than men on tests of mathematics. For example, nationally the average SAT-Math score for women is about .387 standard deviations below the average for men and about 14 percent more women score below 500 than do men. Interpretation of the above table is complicated by the fact that more men are exempt from taking the ELM exam and by the fact that the ELM scores are not normally distributed. Given these factors, the 10 percent difference in passing rates is about what would be expected.

A study was made of the passing rate by ethnic background (Appendix 10) and, as would be expected, a wide variation was found. It is important, however, that individuals not be characterized by the statistics for their entire group. For example, if members of a particular group perform poorly on the test as a group, there will be some of the group who do well on the test; the test distribution of their total scores extends to the highest possible test score. Conversely, if there is a group which does quite well on the test, there will still be some who do poorly, so that the total score distribution extends to the lowest scores.

Performance by High School Preparation

Students taking the ELM exam are asked to provide certain background information on the answer sheet. For example, students are asked to indicate the grades they received in certain college preparatory mathematics courses. (ETS has found that this information is fairly reliable.) Given such information, it is possible to examine the relationships between the grades in these courses and the ELM exam scores. The table below shows the average ELM scores for persons receiving the grades of A, B, C or D in college preparatory mathematics courses.

Grade	Algebra I	Geometry	Algebra II	Trigonometry
A	40.9	43.1	44.7	48.2
B	35.9	38.8	40.0	44.1
C	31.2	33.8	35.9	40.5
D	24.9	29.4	32.8	38.1

Based on these data, it is easy to see that even though the ELM exam covers little beyond Algebra I in its content, a student has a much better chance of passing the ELM exam if he or she has taken three or more years of college preparatory mathematics, regardless of the grade received.

Remediation Efforts

Unlike the English Placement Test (EPT) program, the ELM examination program receives no direct legislative funding appropriation either for testing or for remediation. The deficiencies in entry-level skills identified through use of the ELM exam must be remedied either through the individual initiative of the student or through programs provided by the campus. Where enrollment caps on the campuses have been reached, the offering of remedial instruction may mean that some college-level mathematics instruction cannot be offered. On other campuses which have not reached their enrollment maximums, the enrollment generated by remedial instruction may also generate the additional resources necessary to offer such courses. The attitude of campus faculty and administrators toward remedial instruction may vary according to the level of campus enrollment and according to philosophical tenets regarding the university and its societal role(s).

In addition to campus remedial efforts, the systemwide office has provided a tool for use by students who need to review their mathematics training before taking the test, the ELM Workbook. The 184-problem workbook includes an answer key and space for students to calculate the solutions to problems. The problems presented are parallel to those included in the ELM exam. Although it is not a textbook, the workbook is designed to offer students an opportunity to rework concepts and problems and to refresh dormant mathematical skills. For some, it may eliminate the need to take remedial courses and allow them to proceed directly to passing the ELM exam. Campuses obtain stocks of the workbook from the bookstore at California State University, Long Beach.

In discussing remediation, it should be noted that both UC and CSU have been asked by the California Postsecondary Education Commission to develop "a plan whose goal is to reduce remedial activities in reading, writing, mathematics and English as a Second Language within a five-year period to a level consonant with the principles of both quality and access as determined by each segment." A plan has been developed in the CSU which will address the twin problems of student underpreparation and the need to reduce the amount of non-college level instruction offered in higher education. It is likely, therefore, that future attempts to provide assistance to entering students with inadequate mathematical skills will be directed, at least in part, toward improvement in secondary programs and in student preparation before matriculation in the CSU. The long-range goal is to reduce remediation to the level necessary to provide assistance to students entering as exceptional admits as well as to adults reentering college after many years absence.

Evaluation

The Task Force on Entry-Level Mathematics Skills identified systematic evaluation as a major component of any successful testing program. Accordingly, a ten-member ELM Evaluation Committee met during summer 1983 to prepare an evaluation design for campus and systemwide studies.

The evaluation design addressed the following issues:

1. Goals and Assumptions of the Evaluation Design
2. ELM Exam Program Areas of Study
3. Data Success
4. Timelines
5. Resource Implications

Campus faculty and administrators were urged to develop evaluation designs which specifically addressed one or more of the 16 items prepared for study. The items fell into five broad categories:

1. Long-Term Changes in the CSU Applicant Pool
2. Changes in CSU Student Behavior
3. CSU Curriculum Changes and Reduction in Need for Remediation
4. Test Validity
5. Process Objectives

The formal Request for Proposals (Appendix 11) noted that most of the research agenda suggested that "changes" over time be measured — in the CSU

applicant pool, in student behavior, and in the curriculum. Accordingly, studies were encouraged which envisioned time-series and longitudinal designs, as well as ones which evaluated campus remediation programs.

A modest amount of grant money was made available for assigned time, clerical and student assistance, and supplies and materials not otherwise available through normal campus support. Proposals could range up to $1,000, and although the research design could extend for several semesters, funding for the initial phase of the research covered only the period March 1 through June 30, 1984.

A total of 22 campus proposals were reviewed by the ELM Evaluation Committee, and 14 projects from 9 campuses were funded (from the ELM Trust Fund) at a total cost of $9,821. The following figures provide an overview of the scope of the proposals:

Nature of Research Proposal	Number Received	Number Funded
Remediation only	8	5
Remediation plus other topics	5	5
Topics other than remediation	9	4

None of the proposals addressed the high school applicant pool. However, a few did propose to set in motion long-term longitudinal studies extending beyond the formal funding period. At this writing ten final reports were received from among the 14 projects funded.

Brief Description of Funded Projects

The participating campuses and their projects were:

CSU DOMINGUEZ HILLS —

There were three projects working together to develop a data base containing information on ELM-examinees, their mathematical preparation, remediation efforts, and quantitative reasoning course performance for use in longitudinal studies.

CSU FRESNO —

This study was designed to obtain and evaluate data to correlate (1) performance in intermediate algebra and performance on the ELM exam, and (2) performance in remedial courses and performance on the ELM exam.

CSU LONG BEACH —

This campus had two projects. One was designed to study the effects of fatigue on performance on the ELM exam, comparing students who take the ELM exam and then the EPT with students who take the exams in the reverse. The other study considered the pass/fail rates on the ELM as a function of the following student categories: (1) gender, (2) age level, (3) major field of study, (4) ethnicity, (5) basis of admission, (6) high school mathematics background, (7) duration of time since high school math courses were taken, and (8) post high school mathematics remediation.

CSU NORTHRIDGE —

This study included both formative and summative evaluation procedures to determine the effectiveness of the developmental course in preparing students for the ELM exam, as well as procedures to evaluate the effectiveness of the ELM exam in predicting success in university-level mathematics courses.

CSU SACRAMENTO —

This project was intended to evaluate the effectiveness of the remediation program in preparing students for the ELM exam and the quantitative reasoning course.

CSU SAN BERNARDINO —

This study would provide for a systematic tracking of ELM exam takers, to see how they have fared on subsequent attempts and how students who passed have performed in subsequent mathematics courses.

SAN FRANCISCO STATE UNIVERSITY —

This research focused on student performance in high school mathematics courses, student performance in quantitative reasoning courses, and campus remediation programs, in order to address the issue of test validity.

SAN JOSE STATE UNIVERSITY —

This campus received funding for three separate projects. The first proposed to obtain and tabulate ELM exam results for all students who enrolled in the ELM remediation course. An analysis would then be undertaken to assess the effectiveness of the remediation course. A second project considered the students who enrolled at San Jose State University and failed the ELM exam, but did not enroll in the class provided as preparation for the quantitative reasoning courses.

These students were to be contacted to determine the demographics of the group, their reasons for not enrolling, and the results when they tried to take the ELM exam again. The third study was made to assess the effectiveness of the ELM exam as a screening device for the quantitative reasoning courses.

SONOMA STATE UNIVERSITY —

This project studied the significance of remediation on repeat ELM exam performance.

Results of the Evaluation Studies

The evaluation studies found three common failings among ELM exam participants:

1. The high failure rate on the exam can be attributed, in part, to poor test preparation. One survey found that fully 48 percent of test takers admitted to "doing nothing" to prepare for the test, while another 26 percent said that they merely "studied on their own." Other studies, too, found little evidence of rigorous, systematic preparation. Although students may understand the necessity to take the test, they seem not to fully appreciate the consequences of failing it.

2. Even after failing the test, relatively few students avail themselves of remedial courses and other programs of assistance. Several studies found that only about one-fourth of those who failed the exam signed up for a formal remediation course the following semester.

3. Even if students do make use of remedial and other assistance programs, they often do not take the ELM exam immediately thereafter. In a couple of studies, fewer than 20 percent of the students who completed remedial math courses showed up for the next ELM exam administration.

One might argue that such findings are the "fault" of the institution, i.e., in terms of inadequate publicity and student advising. However, there was considerable evidence in these studies that large numbers of students simply do not use the many forms of information and assistance offered to them. It seems probable that until students themselves assume a greater sense of responsibility for passing the exam, failure rates will remain high, despite campus efforts to improve them. In the words of one report, "the most urgent task now facing the ELM program may be that of making students not only aware of the reality of the ELM requirement, but causing them to accept its inevitability as well."

On the other hand, it seems quite clear that formal remediation has a positive effect on almost all students. Several studies found that a one-semester remedial algebra course raised total scores an average of almost 11 points. Thus, all but the lowest achievers can expect to pass ELM following remediation. Without formal assistance, only about 25 percent pass on the second try, and the average gain for these students is usually less than five points.

In one study, fully 82 percent of the students completing a formal remedial course later passed the ELM exam with an average gain in their total score of 11 points. In another, 72 percent were successful on the repeat ELM exam.

Yet another study found that students can expect an average increase of 5 to 15 points in their total scores compared to what might be achieved in the absence of remediation. However, even an increase of 15 points would result in a passing score (i,e., 38 or higher) only for students whose pre-remediation score was above 22. Since 20 to 25 percent of enrolled students systemwide fail to achieve scores of 23 or above, it seems clear that one semester of elementary algebra is not sufficient remediation for a large group of students, prompting these conclusions (at a campus where intermediate algebra is considered a remedial course):

1. Students with ELM exam scores in the interval 33–37 should be encouraged to enroll in an intermediate algebra class, but advised that their prospects for passing the ELM exam after a serious program of self-study are very good.

2. Students with ELM exam scores in the interval 23–32 should be encouraged to enroll in intermediate algebra or elementary algebra depending on their previous mathematics background, and advised that their prospects for passing the ELM exam after satisfactory completion of that course are reasonably good.

3. Students with ELM scores below 23 should be encouraged to enroll in elementary algebra, but they should be advised that their prospects for passing the ELM exam after completing the course are not very good, and they should anticipate the need to subsequently enroll in a second semester of mathematics remediation, assuming that they passed elementary algebra.

With these designations, it is interesting to see the numbers in each of these categories:

First Time Freshmen-First Time Test-takers

Scores	Number	Percent
38 or above	6,446	52.2
33 to 37	1,612	13.0
23 to 32	2,714	22.0
22 or less	1,583	12.8
Total	12,355	100.0

A complete distribution of ELM exam scores is given in Appendix 9.

In addition to these general findings concerning student preparation and remediation, four other studies produced results of a somewhat more specific nature. They include:

1. There is some evidence that at least three years of high school math are required to pass the ELM exam on the first try. Currently, only two years of college preparatory mathematics are required for admission to the CSU system.

2. Passage of the ELM exam, in itself, is not a good predictor of student performance in quantitative reasoning courses other than intermediate algebra.

3. One study analyzed the extent to which "test fatigue" might have independently influenced ELM results. Specifically, it was hypothesized that the order of test administration for the ELM exam and the English Placement Test (EPT) might have a significant effect on ELM performance, which is administered following the three-hour EPT. The study found that, in general, students taking the ELM exam before the EPT did not perform significantly better on the ELM exam than students taking the EPT first. However, a marginally significant effect of test administration order on ELM performance was obtained for female students, particularly those 18 years of age. That result could be attributed to test anxiety. Students who experience test anxiety and take the ELM exam after the EPT may perform poorly on the ELM exam because they have already spent nearly three hours coping with their tension while taking the EPT. It is recommended that students who experience test anxiety be advised to take the EPT and ELM exam on separate dates.

4. Another study conducted at CSU, Long Beach, examined student performance on the ELM exam as a function of demographic variables and mathematics background. A few of the findings are:

   a. Students 17, 18 and 19 years of age perform much better than those 22 years of age or older; students 20 or 21 years old do not differ significantly from either of these sets of students.

   b. Freshmen perform better than students with sophomore or higher class standing. However, class standing does not differentiate performance on the ELM exam when the influence of student age on the performance measures is controlled statistically.

   c. Newly admitted first-time freshmen and new transfer students perform better than students who have completed one or more semesters at CSULB.

   d. Except for non-citizens, students who last took a mathematics course less than one year from the test administration date perform much better than students who last took a mathematics course one or more years before the exam.

For more information about these evaluation studies, contact the Division of Academic Program Improvement at the Chancellor's Office.

Finally, the most important questions about the ELM exam are long-term in nature, and their answers depend on the development of comprehensive, longitudinal data bases. Appendices 12 and 13 show the survey form and data base dictionary produced by the team of investigators at CSU, Dominguez Hills. The initial stages of data-base construction have been completed, and some preliminary findings from the student survey are available. However, the full potential of the model will be realized only through additional campus and systemwide support.

III. FUTURE OF THE ELM PROGRAM

All concerned in the CSU system hope that the existence of the ELM examination requirement will result in students entering the university with better preparation in mathematics than has been demonstrated by the first year of the program. This would greatly reduce the need for remedial programs, saving the student both time and money, and saving large amounts of the state's resources. However, until this change takes place, the ELM exam will continue to be administered in order to verify that entering students come with basic competence in mathematical skills. Exam results will continue to be monitored and analyzed to determine trends in students' preparations for college.

It is hoped that the program will soon be funded as the EPT program is funded. Students must pay to take this exam and they pay each time that they retake the exam. Campuses are pressed for resources to provide remedial courses for their students. Funding should be provided for students and the campuses, as it is with the EPT program.

Finally, it should be noted that if admission requirements are changed so that entering students must have three years of college preparatory mathematics before coming to the CSU, the level of mathematics which can receive college credit will change. For example, intermediate algebra can be taken for credit on some CSU campuses at this time; however, if intermediate algebra is a requirement for entrance to the CSU, such a course would need to be considered a remedial course if taught on a CSU campus. The result of such changes would be that the level of mathematics tested on the ELM exam would need to be raised. Again this would be done with an extended period of preparation, giving ample notice to everyone in the state that such a change is taking place.

LIST OF APPENDICES

1. CSU Academic Senate Resolution Number AS-1238-81/EP
2. List of Members, Task Force on Entry-Level Mathematics Skills
3. Report of the Task Force on Entry-Level Mathematics Skills
4. Entry-Level Mathematics (ELM) Brochure
5. CSU Chancellor's Executive Order 416: Determination of Competency in Entry-Level Mathematics
6. List of Members, Entry-Level Mathematics Examination Development Committee (for 1984-85)
7. CSU Chancellor's Executive Order 342: Certification of General Education-Breadth Requirements by Regionally Accredited Institutions
8. Statistical Table: Entry-Level Mathematics Performance Levels by Campus, First Time Test-takers and Entry-Level Mathematics Performance Levels by Campus, First Time Freshmen-First Time Test-takers (FTF-FTTs)
9. Statistical Table: Distribution of Entry-Level Mathematics Total Scores, First Time Test-Takers (FTTs)
10. Statistical Tables: Entry-Level Mathematics Performance by Ethnic Background and by Sex and Ethnic Groups, FTF-FTTs
11. Request for Proposals, Entry-Level Mathematics Exam Evaluation
12. CSU, Dominguez Hills Mathematics Survey Questionnaire
13. CSU, Dominguez Hills Entry-Level Mathematics Data Base Dictionary

ACADEMIC SENATE
of
THE CALIFORNIA STATE UNIVERSITY AND COLLEGES

AS-1238-81/EP
May 7-8, 1981

EXAMINATION FOR DETERMINING ENTRY-LEVEL LEARNING SKILLS IN MATHEMATICAL COMPUTATION

WHEREAS, The Entry-Level Learning Skills Provisions of Title 5 declare that "each student admitted to The California State University and Colleges is expected to possess basic competence in the English language and mathematical computation to the degree that such competence may be reasonably expected of entering college students. Students admitted who cannot demonstrate such basic competence should be identified as quickly as possible and be required to take steps to overcome their deficiencies. Any coursework completed primarily for this purpose shall not be applicable to the baccalaureate degree; and

WHEREAS, Executive Order 338 further declares that:

To implement this policy each campus shall accomplish the following steps not later than the beginning of the Fall term, 1982:

A. Determine appropriate entry-level skills for English language and mathematical computation.
B. Institute means for determining whether new students possess such skills.
C. Identify those courses and other means for achieving requisite skill levels where they do not exist.
D. Institute policies and procedures to ensure that baccalaureate credit is not granted for such courses; and

WHEREAS, The California State University and Colleges has already developed and is administering the English Placement Test to determine basic competence of entering students in the English language; and

WHEREAS, The CSUC campus respondents to the Educational Policies Committee's request for information on "Remedial and Non-Baccalaureate Level Instruction in the CSUC," have supported the development of a systemwide examination to determine the mathematical computational skills of entering students; and

WHEREAS, The CSUC Mathematics Department Chairs recommend that a uniform diagnostic examination be developed to evaluate mastery of the Entry Level Learning Skills in Mathematical Computation and also recommend that a standard achievement level be established for this examination and shall be used by all campuses in the CSUC system to determine mastery of the Entry Level Learning Skills in Mathematical Computation; therefore be it

RESOLVED: That the Academic Senate of The California State University and Colleges recommend to the Chancellor and the Board of Trustees that a systemwide diagnostic placement examination be required of all new undergraduate CSUC students which will test them for Entry Level Learning Skills in Mathematical Computation; and be it further

RESOLVED: That the Academic Senate CSUC recommend that the Chancellor appoint a committee composed primarily of representatives from CSUC mathematic faculty and recommended by the Academic Senate CSUC to be charged with drawing up specifications and guidelines for this systemwide examination; and be it further

RESOLVED: That the Academic Senate CSUC recommend that the Chancellor begin study of the potential costs of administering such an examination and the budgetary impact of remediation in mathematics which may be necessary; and be it further

RESOLVED: That the systemwide examination be developed for implementation as soon as practicable.

APPROVED UNANIMOUSLY May 8, 1981

CSU Task Force on Entry-Level Mathematics Skills

1981-1982

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REPORT OF THE TASK FORCE ON ENTRY-LEVEL MATH SKILLS

Background

Competence in basic mathematics has become as important to students' success in the university as writing proficiency. Today all students, not just those who major in technical fields, need to enter CSU having mastered arithmetic as well as elementary algebra and geometry. More and more majors require mathematics courses. Most Schools of Business require students to complete a calculus course. Some 20% of all CSU students today are business majors. And students majoring in nontechnical fields find that knowledge of computers enables them to apply the methodology of their discipline in new ways.

During discussion of changes in General Education requirements that began in 1978, faculty proposed that all CSU graduates have instruction in mathematical concepts and quantitative reasoning as part of their educational experience. It soon became clear that if the courses to teach quantitative reasoning were to be given at a level appropriate to university study, entering students would need to have a minimum level of competence in mathematics.

Consequently the Trustees voted to amend Title 5, California Administrative Code, Section 40405, to stipulate that each student admitted to The California State University be expected to possess basic competence in the English language and mathematical computation to the degree that such competence may be reasonably expected of entering college students. To implement Trustee policy, Executive Order 338, General Education-Breadth Requirements, required that each campus determine appropriate entry-level skills for English language and mathematical computation and institute means for determining whether new students possess such skills.

As campus chairs of mathematics departments considered the task of determining the level of skill and the expense of identifying or creating means to measure it on each campus, they recognized that considerable effort and expense might be saved if a uniform systemwide policy on entry-level math skills were established. They proposed that:

1. The CSU system identify uniform entry-level learning skills in mathematical computation applicable at all campuses.

2. These skills include at minimum the following:

   A. Arithmetic computations
   B. Elementary algebra
   C. Solution of word problems in arithmetic and algebra

3. A uniform diagnostic examination be developed to evaluate mastery of the entry-level learning skills in mathematical computation. A standard achievement level be established for this examination and be used by all campuses in the CSU system to determine mastery of the entry-level learning skills in mathematics.

Consultation with campus presidents and vice presidents for academic affairs revealed general support for such a minimum standard. After consulting with campus senates, the Statewide Academic Senate passed a resolution supporting a systemwide approach.

The Task Force

In response to this interest in a systemwide policy on entry-level math, Vice Chancellor Alex C. Sherriffs appointed a Task Force on Entry-Level Math Skills. It includes faculty in mathematics as well as faculty from the sciences, social sciences, humanities, business, and education and a Test Officer. A representative of the Vice Presidents for Academic Affairs and Chancellor's Office staff from Academic Affairs are members as well. Names of members are found in Appendix A.

The Task Force was asked to prepare formal recommendations on:

1. The need to modify formally the portion of Executive Order 338 calling for each campus to establish policy on entry-level math skills in view of the widespread interest in a systemwide approach,

2. the minimum level of competence in mathematical computation each entering student should have, and

3. the means by which student competence is to be measured.

Discussion

The Task Force on Entry-Level Math Skills met during the 1981-82 academic year. Throughout its deliberations the group was conscious of the far-reaching implications for students, campus faculty, and administrators of implementation of the portion of Trustee policy on General Education for entry-level skills in mathematics. The requirement for minimum competence in math for all students is a major change for the CSU. Indeed, CSU is the only state university system in the nation to establish such a standard of competence for all entering students. Although the Task Force believes that imposition of an admissions requirement of two years of college preparatory math effective fall 1984 will improve student preparation, members recognize that for students who do not plan to study math-related subjects and who do not realize that math skills are desirable, even necessary, for other fields of study, the examination requirement will be a surprise. Such students will typically have the minimum high school preparation in math, have taken those courses early in their high school career, and have forgotten much of what they have learned when they enter CSU. Many of these students will not be able to demonstrate minimum competence and will have to undertake remedial study. The Task Force is equally concerned about the effect an examination for minimum competence may have on students who do intend to study math-related subjects and who plan to take four years of high school math. The entry-level examination requirement may lead these students to believe erroneously that taking two years of high school math to gain the competencies specified on the exam is adequate preparation. A third concern of the Task Force has been that by setting minimum entry-level competencies, CSU may be

leading high school teachers to believe that in college preparatory courses they need teach only those skills and knowledge required to pass the test.

To address the problems that may result from the requirement of the entry-level exam, the Task Force believes it is essential that CSU publicize the existence of this examination extensively and at the same time make clear that four years of math in high school is desirable for all and, indeed, essential to those who plan a math-related major, and that high school courses should include instruction that goes beyond test specifications. In addition to publications for students and parents, CSU should provide workshops for teachers of mathematics. These should stress both information about the competencies identified by CSU and the need to teach more than the minimum skills and knowledge. CSU should promote development of parallel forms of the test and make them available to high school teachers to give students in their junior year. Teachers should advise students who do not do well to take courses in their senior year that will prepare them for CSU's entry-level math test.

The Task Force recognizes that requiring all entering students to pass a mathematics exam will, especially at first, likely create demand for remediation in mathematics. According to Executive Order 338, students who cannot demonstrate competence are to "be required to take steps to overcome their deficiencies." These student-initiated efforts may range from independent review, tutorial help in a Learning Assistance Center, to enrollment in a remedial course at a community college or on the campus if such courses are offered. Executive Order 338 requires only that a campus "identify those courses and other means for achieving requisite skill levels"; it does not require a campus to offer remedial courses. If, however, a campus does offer remedial courses, Executive Order 338 precludes award of baccalaureate credit for such courses.

The Task Force makes no formal recommendation about remediation, but instead urges each campus to begin now to consider its plans and policies for those students who will not meet minimum competence and encourages the system staff to assist campuses as they seek to find ways of meeting students' needs. Despite the problems that may follow as a result of many students failing to demonstrate minimum competence, the Task Force believes that these should not deter the system from requiring an examination to determine minimum level of competence in mathematics of its entering students. The resulting improvement in the quality of students' educational experiences and preparation for further learning are worth the difficulty created in the early phases of implementation. Once the policy is widely enforced and understood, the Task Force believes that a majority of students will select courses and apply themselves seriously enough in high school to achieve minimum competence before they enter CSU. The Task Force will monitor implementation of the examination requirement over several years, inviting campuses to comment on the impact of the policy.

Formal Recommendations

The Task Force's specific recommendations are:

1. That Executive Order 338 be modified to defer the effective date of the mathematics Entry Level Skills portion until fall 1983. Campuses that wish to proceed with implementation on entry-level skills requirements may proceed sooner if they choose.

Comment:

The Task Force did not believe that it could complete its deliberations in time to complete consultation about its recommendations and, if accepted, to have recommendations implemented by fall 1982. The Chancellor has agreed to delay implementation of the requirement until fall 1983. Campuses were advised of the delay in a letter from Vice Chancellor Sherriffs in March. (See Appendix B.)

2. That the minimum level of competence required of entering students be the skills and knowledge of arithmetic, elementary algebra and plane geometry.

Comment:

These entry-level competencies are those recommended by CSU math department chairs. They correlate with what students should learn in 2 years of rigorous college preparatory math courses. Beginning fall 1984 all entering CSU students must successfully complete two years of such college preparatory math to qualify for admission.

Students possessing the level of competence specified may be expected to be ready to take the first course in quantitative reasoning designated to meet general education requirements, to take intermediate algebra in the mathematics sequence, to take introductory courses in economics or statistics, to take history of mathematics, math for elementary teachers or other subjects in which understanding of mathematical concepts is essential. It is anticipated that requiring students to have minimum competence in math will improve their chances for success in these courses and that faculty can raise the level of instruction in these courses.

Of course, students who plan a math-related major should take four years of college preparatory math in high school and be prepared to take calculus as their first course in the mathematics sequence.

Under the terms of Executive Order 338, students would not receive baccalaureate credit for courses that teach the entry-level skills as defined by the test. For example, students would not receive baccalaureate credit for math courses prerequisite to intermediate or college algebra.

3. That the level of competence be measured by a criterion-referenced examination designed to provide gross diagnosis of mathematical skills and understanding and that the criteria for passing be established by the Task Force and applied uniformly throughout the system.

Comment:

A criterion-referenced examination is recommended because the purpose of the exam is to make sure that students have the mathematical skills and knowledge expected of entering college students. The criteria have been established through test specifications. Students will be measured against these. A norm-referenced examination which would measure students' performance by comparing them to others in the group would not provide the information about mastery needed to determine entry-level proficiency.

The examination is to include 60 items in multiple-choice format requiring about an hour to take. It will test for the ability to understand mathematics, not just to use computational skills. Some 20% of the items will cover arithmetic; 60% will cover algebra; and 20% will cover geometry. Although final decisions must await pilot study, the Task Force anticipates that to achieve minimum competence a student would need to provide 80% correct replies for arithmetic, 60% correct replies both for algebra and for geometry. Sample items showing the level of mastery required are available on request.

The arithmetic section of the exam will contain a 12-item stratified sample of the topics in the arithmetic specifications. If a student answers any 9 items correctly, he/she will pass this section. If a student fails this portion of the exam, however, he/she fails the exam as a whole. The algebra/geometry section will feature a 48-item stratified sample of the topics in the algebra/geometry specifications. If a student answers any 29 items he/she will pass this section. The items will be chosen to fall into the following 7 categories:

Polynomials (8)
Linear Equations (7)
Quadratic Equations (5)
Rational Expressions (7)
Exponents (6)
Ratio, Graphs, Percent (7)
Geometry (8)

Ten (10) word problems will be integrated into the above topics as well. Analysis will be performed to assure that these are free of cultural bias.

The criterion-referenced examination will indicate whether students' weaknesses lie in arithmetic, algebra, or geometry. Although test scores will be reported with subscores in the 7 algebra and geometry categories and scores signifying competence recommended for campus use, the test is too brief to provide subtle diagnostic information. Still other examinations must be administered locally if a student has failed to demonstrate competence on this test and if prescriptive diagnosis is deemed necessary by the campus. The examination will not discriminate at the higher levels of student performance. Placement examinations will still be needed to determine student readiness for calculus or precalculus courses.

4. That the UC/CSU Math Diagnostic Test Workgroup be invited to develop an examination according to specifications with algorithms for generation of

alternate forms, that the exam be copyrighted in the name of the CSU and that funds be provided by CSU to develop the test.

Comment:

Dr. Richard Harsh, testing consultant, examined nearly a dozen available tests of arithmetic, algebra, and geometry. Discussion of his analysis and CSU specifications revealed that no existing test met specifications precisely. Those coming closest were the mathematics subtest of the New Jersey Basic Skills Placement Test, 1981-82 (ETS) and the UC/CSU Basic Algebra Test (1981). The NJBSPT contains more arithmetic items than the Task Force specifications called for and more than members believed should be included on a minimum competency examination for entry into college. The NJBSPT does not cover geometry. Required of all newly admitted freshmen in public community and state colleges and the state university, this examination is used to determine students' need for remedial programs. In a report on the Remedial Program at Rutgers, math faculty in several colleges of the University said that the test is too elementary for their needs. Rather than seeking modification of the math portion of the New Jersey examination, the Task Force recommended that the UC/CSU Basic Algebra Test be modified to include arithmetic and to meet other CSU specifications.

The UC/CSU Diagnostic Test workgroup has worked over the past 4 years to develop three math diagnostic examinations. Item analysis and correlation with end-of-course grades reveal that these are well-designed instruments. This group, which includes high school, community college, UC, and CSU faculty has developed considerable expertise in test development working as it has with the principal math test consultant from ETS (Princeton). Utilizing the expertise already gained by this group to develop the CSU test will save time and contribute to a level of reliability of items in the initial version of the test that will reduce the scope of revision following pilot testing.

5. That CSU provide funds for review of the test, pilot test analysis, revision and preparation of a final draft of the test form, and determination of a cut-off score.

Comment:

It is proposed to pilot test the examination on a limited number of CSU campuses which agree to cooperate for fall 1982. The objectives of the campus pilot testing would be to:

a. *Measure the overall reliability of test items by internal consistency methods, perform an item analysis by correlating item scores with total scores, check the reliability of the subtests, and correlate subtest scores with total scores.*

b. *Establish reasonable and practical cut-off scores, both for the two main sections and for diagnostic purposes.*

c. *Estimate the magnitude of the remediation problem.*

d. Correlate the performance of selected students on the exams with grades in subsequent mathematics-based course work, e.g., college algebra, calculus, statistics, economics, etc.

e. Correlate performance with high school g.p.a. and entrance tests (ACT, SAT, etc.) as a basis for action on Recommendation 7 below.

It is desirable that CSU funds be used to develop and refine the CSU exam to assure full CSU control over the examination. If CSU funds are not available, then the assistance of a testing service must be sought. The testing service would then own the test having the prerogative to change emphases and items to suit the needs of other clients.

6. That entering students take the entry-level math exam as soon as possible after being admitted. Campuses should require all students subject to the examination to take it before the end of the first term. Results should be returned to students and to campuses in which they intended to or are enrolled as soon as possible.

Comment:

As a way of encouraging enrollment in math in the senior year of high school, entering students should take the exam in May. There should be as many test dates as resources allow but administration in May, July, October, and December-January is essential. The possibility of demand testing at other times through computer administration should be explored. Coordination with EPT administration is desirable.

7. That there be no exemptions granted to entering CSU students from this entry-level examination except performance on other examinations established through pilot studies as reliable for demonstration of equivalent or superior competence. See Recommendation 9 below on policy for community college transfers.

Comment:

During the pilot year, studies correlating student performance on the SAT mathematics portion, ACT mathematics portion, College Board's Advanced Mathematics Subject Examination, and other standardized tests likely to be taken by high school students prior to matriculation will be conducted. Those tests and scores found to correlate at a statistically significant level with the entry-level math exam will be recommended by the Task Force to be accepted in lieu of a successful performance on the entry-level math exam.

8. That satisfaction of minimum competence be a prerequisite to any campus course that fulfills the GE quantitative reasoning requirement and that math departments and those offering other math-related courses be encouraged to make satisfaction of minimum competence a prerequisite to them as well.

Comment:

If students are allowed to take GE quantitative reasoning or other math-related courses without meeting entry-level standards, then there is no reason to require minimum competence for university work. Instructors in these courses cannot assume a common level of preparation as a foundation on which to build and the level of university instruction will continue to be compromised. Students will regard the demonstration of competence as simply a requirement to be met before graduation.

9. That all community college transfers, both upper- and lower-division, who have not completed the math course certified for GE credit before entering CSU be required to take the CSU entry-level math exam. Courses certified for GE transfer credit should have two years of college preparatory math as prerequisites and should be taught at a level that assumes the students possess the minimum competence called for in the CSU examination.

Comment:

To permit enrollment of community college transfers who have not demonstrated minimum competence in math or math-related courses discriminates unfairly against native CSU students. If students who attend community colleges are not held for the entry-level examination, students who desire to evade the requirement may do so by attending a community college.

10. That registration for and administration of the entry-level math exam be as simple as possible.

Comment:

Consideration should be given to combining registration and administration of the entry-level math exam with the English Placement Test.

11. That students be charged to cover actual costs of test administration and if CSU funds are used for development, then such fees be set to recover development costs over a reasonable period of time.

Comment:

Because the test can be machine scored, costs will likely be less than $10.00.

12. That data on student performance 1) be returned to students and campuses as soon as possible so that students may plan to select appropriate courses and so that campuses may schedule courses, and 2) be collected centrally to aid ongoing analysis of the test.

13. That math test administration be controlled centrally either by a contract with a single testing service working closely with CSU or by a CSU math test center.

Comment:

Centralized administration assures test security, efficiency in scoring, simplifies data collection for purposes of analysis and test revision, and saves duplication of effort on the nineteen campuses. Although administration to admitted but not matriculated students can best be handled centrally, feasibility of demand testing on campuses for enrolled students who have not yet taken the test should be explored.

If plans for test administration involve campus test offices, there will be consultation with Test Officers about feasibility and impact on resources.

14. That system staff make plans to publicize the existence of the test to students and parents, to hold workshops for math teachers, to provide parallel forms of the test for administration in the junior year, and to assist campuses to find ways to direct students to remedial programs.

15. That students who fail the test and are directed to remedial programs be required to retake the examination as the only means of demonstrating minimum competence. Successful completion of a remedial course at the campus or elsewhere should not constitute demonstration of minimum competence.

Comment:

To allow course completion to demonstrate minimum competence will discourage students from taking the test or high school preparation seriously and will create even greater demand for remedial programs at the college level. Of course, provisions would need to be made for demand testing on campus to accommodate students who have just completed a remedial program and want to enroll in a GE course in quantitative reasoning.

5/25/82

APPENDIX A

CSU Task Force on Entry-Level Mathematics Skills

1981-1982

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Special thanks are due to Diane Resek, Associate Professor of Mathematics, San Francisco State, and to Jose Guiterrez, Assistant Professor of Mathematics, San Francisco State, for review and comment on test specifications.

WHERE AND WHEN WILL THE ENTRY LEVEL MATHEMATICS EXAMINATION BE ADMINISTERED?

Both the ELM exam and the English Placement Test (EPT) may be taken on any of the 19 campuses of the CSU. Students need not take the examinations on the campus which they will attend. The ELM exam and the EPT are administered together.

Information bulletins and registration materials for the EPT/ELM exam will be mailed to all students subject to the requirement in their admissions packets or they may be obtained from Admissions and Records offices of any of the CSU campuses. The information bulletin will give the dates for administration of these two exams.

Questions about the ELM Examination should be addressed to:

Academic Program Improvement
Office of the Chancellor
The California State University
400 Golden Shore, Suite 314
Long Beach, CA 90802-4275

Telephone: (213) 590-5714, ATSS 635-5714

November 1983

ENTRY LEVEL MATHEMATICS EXAMINATION

THE CALIFORNIA STATE UNIVERSITY

THE CALIFORNIA STATE UNIVERSITY

ENTRY LEVEL MATHEMATICS EXAMINATION

WHAT IS THE PURPOSE OF THE ENTRY LEVEL MATHEMATICS EXAMINATION?

In order to progress effectively at the university, students need to demonstrate that they have acquired a basic understanding of arithmetic, elementary algebra, and plane geometry. The California State University (CSU) system is requiring that students take an Entry Level Mathematics (ELM) examination which is designed to measure basic skill levels in these three areas.

The ELM exam will test for skills which should have been attained in two years of rigorous college preparatory mathematics. The exam is not a condition for admission to the CSU. Its main purpose is to assure that students are ready for college level work. It may be used for diagnosis of mathematics deficiencies and for prescribing work that students must do before they can begin the study of college level mathematics.

All students, not only those who major in technical fields, require a knowledge of basic mathematics. Basic mathematics provides the necessary background for the CSU general education quantitative reasoning requirement which, on most campuses, consists of a course at the level of college algebra or higher. Such a course is required for graduation.

DOES THE ELM EXAM TEST FOR ADVANCED MATH SKILLS NEEDED BY STUDENTS IN TECHNICAL MAJORS?

No. The ELM exam is a test of minimum math skills required of all students. Those students who may major in fields requiring calculus (this includes business) should prepare to meet more than this minimum requirement. Such students should take 4 years of mathematics. All others would be well advised to take 3 years of math in high school. All students should take some math in their senior year. A detailed outline of topics for high school mathematics courses recommended by the academic senates of the California Community Colleges, the University of California, and The California State University may be found in the *Handbook for Planning an Effective Mathematics Program*, a publication of the State Department of Education.

WHO IS REQUIRED TO TAKE THE ENTRY LEVEL MATHEMATICS EXAMINATION?

Beginning in Fall 1983 all new undergraduate students entering The California State University (CSU) system will be required to take the ELM examination. This new requirement is applicable to all undergraduates who enter under the 1983-84 and subsequent catalogs/bulletins.

Each entering CSU undergraduate student shall demonstrate minimum competence in mathematics by earning a passing score on the CSU Entry Level Mathematics exam except for those who qualify for exemption as described below. First-time freshmen can qualify for exemption on the basis of satisfactory performance on certain equivalent examinations. These examinations and the required minimum score are listed below. Transfer students can qualify for exemption either on the basis of satisfactory performance on an equivalent examination or by having completed the General Education-Breadth Requirement in Quantitative Reasoning, provided it is at the level of intermediate algebra or above, with a grade of 'C' or better.

Exemption from the ELM exam is allowed for performance at or above the level specified below in the following examinations:

Examination	Score
College Board Advanced Placement Math Test (AB or BC)	3
Scholastic Aptitude Test — Mathematics (SAT-M)	530
American College Testing (ACT) — Mathematics	23
College Board Math Achievement Test, Level 1	520
College Board Math Achievement Test, Level 2	540

Students required to take the ELM exam should do so as soon as possible after admission. Those who cannot demonstrate basic competence on this examination will be required to take steps to overcome deficiencies early in their enrollment. Any coursework undertaken primarily to acquire the required competence will not be applicable to the baccalaureate degree. Taking the exam early and then taking whatever steps are prescribed on the basis of exam results will help them get the most from their college experience.

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WHICH TOPICS ARE COVERED BY THE ENTRY LEVEL MATHEMATICS EXAMINATION?

The CSU Entry Level Mathematics Examination requires that students have mastery of arithmetic, knowledge of elementary algebra and geometry, and the ability to solve word problems in these three categories. Review of these topics using a standard high school algebra textbook is strongly encouraged, especially if you have not taken a math course for a year or more.

The ELM exam consists of 65 multiple choice questions. The time allowed for completion is 75 minutes. The exam is designed to assure general adequacy in arithmetic skills, basic algebra and geometric measurement skills, and to permit some diagnosis of deficiencies in specific competencies. Information regarding students' particular deficiencies will make it possible to place them in appropriate courses, course modules or other tutorial environments. Exam items are designed to test understanding of mathematical concepts, not merely computational ability or memorization. A demonstration of knowledge of mathematical processes is necessary. Calculators may not be used in this examination.

The following topics are covered on the ELM exam. This list is comprehensive, and it should be understood that not all versions of the exam will contain all of these topics.

CLUSTER A. ARITHMETIC SKILLS (12 Questions)

1. Whole numbers and their operations
2. Fractions and their operations
3. Decimals and their operations
4. Exponentiation and square roots
5. Fraction-decimal conversion
6. Applications (e.g., average, percents and word problems)

CLUSTER B: ELEMENTARY ALGEBRA SKILLS (36 Questions)

1. Operations with polynomial expressions
   - 1.1 Simplification of a polynomial by grouping — one and two variables
   - 1.2 Evaluation of a polynomial — one and two variables
   - 1.3 Addition and subtraction of polynomials
   - 1.4 Multiplication of a monomial with a polynomial
   - 1.5 Multiplication of two binomials
   - 1.6 Squaring a binomial
   - 1.7 Division of polynomials with a monomial divisor — no remainder
   - 1.8 Division of polynomials with a linear binomial divisor — no remainder
   - 1.9 Factoring polynomials by finding common factors
   - 1.10 Factoring a trinomial
   - 1.11 Factoring a difference of squares
2. Operations with rational expressions
   - 2.1 Simplification of a rational expression by cancellation of common factors — one and two variables
   - 2.2 Evaluation of a rational expression — one and two variables
   - 2.3 Addition and subtraction of rational expressions
   - 2.4 Multiplication and division of rational expressions
   - 2.5 Simplification of a compound rational expression
3. Operations with integral exponents
   - 3.1 Definition of exponentiation with positive exponents
   - 3.2 Laws of exponents with positive exponents
   - 3.3 Simplification of an expression with positive exponents
   - 3.4 Definition of exponentiation with integral exponents
   - 3.5 Laws of exponents with integral exponents
   - 3.6 Simplification of an expression with integral exponents
   - 3.7 Scientific notation
4. Operations with square roots
   - 4.1 Definition of radical sign
   - 4.2 Simplification of products under a single radical
   - 4.3 Addition and subtraction of radical expressions
   - 4.4 Multiplication of radical expressions
   - 4.5 Solution of a simple radical equation
5. Solution of linear equations and inequalities
   - 5.1 Solution of a linear equation in one unknown with numerical coefficients
   - 5.2 Solution of a simple equation in one unknown with literal coefficients
   - 5.3 Ratio and proportion
   - 5.4 Solution of a simple equation in one unknown which is reducible to a linear equation
   - 5.5 Solution of a linear inequality in one unknown with numerical coefficients
   - 5.6 Solution of two linear equations in two unknowns with numerical coefficients — by substitution
   - 5.7 Solution of two linear equations in two unknowns with numerical coefficients — by elimination
6. Solution of quadratic equations
   - 6.1 Solution of a quadratic equation from factored form
   - 6.2 Solution of a quadratic equation by factoring
7. Graphing
   - 7.1 Graphing a point on the number line
   - 7.2 Graphing linear inequalities in one unknown
   - 7.3 Graphing a point in the coordinate plane
   - 7.4 Graphing a simple linear equation: $y = mx$, $y = b$, $x = b$
   - 7.5 Reading data from a graph

CLUSTER C: GEOMETRIC MEASUREMENT SKILLS (12 Questions)

1. Measurement formulas for perimeter and area of triangles, squares, rectangles, and parallelograms
2. Measurement formulas for circumference and area of circles
3. Measurement formulas for volume of cubes, cylinders, rectangular solids, and spheres
4. The sum of the interior angles of a triangle
5. Properties of isosceles and equilateral triangles
6. Properties of similar and congruent triangles
7. The Pythagorean theorem and special triangles (45-45-90, 30-60-90)
8. Parallelism and perpendicularity

ENTRY LEVEL MATHEMATICS EXAMINATION SAMPLE QUESTIONS

Following are some ELM exam sample questions. They are illustrative and do not constitute a comprehensive set of questions.

$\sqrt{64x^{14}} =$

(A) $64x^7$ (B) $32x^7$ (C) $8x^7$ (D) $32x^4$ (E) $8x^4$

$\frac{7}{16} \times 24 =$

(A) $\frac{21}{2}$ (B) $\frac{14}{3}$ (C) $\frac{13}{12}$ (D) $\frac{31}{16}$ (E) $\frac{7}{384}$

$\frac{6x^2y}{30x^2y^2 - 18xy^2} =$

(A) $\frac{xy}{5x - 3y}$ (B) $\frac{xy}{5x^2 - 3y}$ (C) $\frac{x}{5x^2y - 3y}$ (D) $\frac{y}{6y - 3}$ (E) $\frac{x}{2}$

In the figure shown, to the right, BC ∥ DE.

What is the length of AC?

(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

If $-3x + 6 = 2x - 9$, then $x =$

(A) 15 (B) 3 (C) $-\frac{3}{5}$ (D) -3 (E) -15

If the price of a fishing reel which originally sold for $35 was reduced by 25%, what is the new price?

(A) $28.00 (B) $26.25 (C) $17.50 (D) $8.75 (E) $7.00

All possible values of x for which $2x^2 - 4x = 0$ are

(A) 2 only (B) 0 only (C) 0 and 2 (D) −2 and 2 (E) −2 only

Five runners in a 100-yard dash ran the race in 13.4, 12.9, 15.0, 12.9, and 14.6 seconds, respectively. What was the average time in seconds for runners to complete that race?

(A) 68.80 (B) 17.20 (C) 13.95 (D) 13.76 (E) 13.40

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THE CALIFORNIA STATE UNIVERSITY
Office of the Chancellor
400 Golden Shore
Long Beach, California 90802

(213) 590-5512

Date: June 1, 1983

To: Presidents

From: Harry Harmon
Executive Vice Chancellor

Subject: Executive Order No. 416
Determination of Competence in Entry Level Mathematics

I am transmitting to you five copies of Executive Order No. 416 which establishes policies and procedures for the development and implementation of entry level mathematics competence programs.

The President has the responsibility for implementing this Executive Order and for maintaining the campus repository and index for all Executive Orders.

Please address any questions regarding this Executive Order to the Vice Chancellor, Academic Affairs.

HH:md

Attachments

Distribution:

Vice President, Academic Affairs
Chairs, Local Academic Senates/Councils
Deans, Directors of Admissions
Deans, Undergraduate Studies
Chancellor's Office

Executive Order No. 416

THE CALIFORNIA STATE UNIVERSITY
Office of the Chancellor
400 Golden Shore
Long Beach, California 90802

Executive Order No: 416

Title: Determination of Competence in Entry Level Mathematics

Effective Date: Fall Term 1983

Supersedes: Parts of Executive Order 338

This Executive Order is issued pursuant to Title 5, California Administrative Code, Sections 40405.1–40405.4, specifically Sections 40405.1 and 40405.4, and Sections 1 and 2 of Chapter III of the Standing Orders of the Board of Trustees of The California State University.

This Executive Order supersedes the portion of Executive Order 338, Part III, A and B pertaining to mathematics competence to be demonstrated by entering college students. This order adopts more specific, systemwide procedures. This Executive Order shall be effective for undergraduate students entering under the 1983-84 catalog or bulletin or thereafter.

1. Each entering CSU undergraduate student shall demonstrate minimum competence in mathematics by earning a passing score on the CSU Entry Level Mathematics (ELM) Examination except those who qualify for exemption as described below. First-time freshmen can qualify for an exemption on the basis of satisfactory performance on examinations recommended as equivalent by the CSU Entry Level Mathematics Examination Development Committee. These examinations and the required minimum score are described in Addendum A. Transfer students can qualify for an exemption either on the basis of satisfactory performance on an equivalent examination as described above *or* by having completed the General Education-Breadth Quantitative Reasoning Requirement provided it is at the level of intermediate algebra or above with a grade of C or better.

2. The Chancellor shall appoint from the mathematics faculty a CSU Entry Level Mathematics Examination Development Committee who shall review and revise the ELM exam at least annually. It shall determine the passing score on the ELM examination which shall be applied uniformly throughout the system. That score and the nature and level of examination exemptions shall be reviewed annually by the same committee.

3. Each student subject to the ELM examination shall be encouraged to take it as soon as possible after being admitted. Campuses, however, shall *require* the student to do so before the end of the first semester or the first two quarters of enrollment. A student who does not take the examination shall be subject to the provisions of Executive Order 393 which authorizes campuses to apply sanctions to students who do not comply with academic policies. Campuses may grant one term exemptions where students can demonstrate that circumstances beyond their control prevented their taking the ELM examination.

4. Campuses shall insure that students who do not demonstrate the requisite competence be required to take timely steps to overcome their deficiencies, culminating in a successful repeat of the ELM examination or a retired form of the CSU ELM examination approved by the ELM Examination Development Committee.

5. Campuses shall permit entering students to enroll in courses which meet the General Education-Breadth Requirement for Quantitative Reasoning only after they have demonstrated competence in entry level mathematics. Campuses are free to designate other courses for which satisfaction of the entry level math requirement is prerequisite.

6. Campus procedures established under Executive Order No. 338, Section III, dealing with mathematical competence, may continue to be applied to students enrolled before the effective date of this Executive Order.

W. Ann Reynolds, Chancellor

Date: June 1, 1983

Exemption for satisfactory performance on an alternate examination – students will be exempted from the ELM examination for having performed at or above the level specified below in the following examinations:

Score	Examination
3	Advanced Placement Math (AB or BC)
530	SAT–M
23	ACT Mathematics
520	College Board Math Achievement, Level 1
540	College Board Math Achievement, Level 2

THE CALIFORNIA STATE UNIVERSITY

Appendix 6

Entry Level Mathematics Exam
Development Committee

1984-85*

Dr. Philip Emig (1986)
Department of Mathematics
California State University,
Northridge
18111 Nordhoff Street
Northridge, California 91330

Dr. Wallace Etterbeek (1985)
Department of Mathematics
California State University,
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Dr. Gerald Marley (1985)
Department of Mathematics
California State University,
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Fullerton, California 92634

Dr. Merriline Smith (1986)
Department of Mathematics
California State Polytechnic
University, Pomona
3801 West Temple Avenue
Pomona, California 91768

Dr. Robert Stein (1987)
Department of Mathematics
California State College,
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San Bernardino, California 92407

Dr. Peter Tannenbaum (1987)
Department of Mathematics
California State University,
Fresno
Shaw and Cedar Avenues
Fresno, California 93740

*Terms expire on June 1 of the year in parentheses.

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THE CALIFORNIA STATE UNIVERSITY AND COLLEGES
Office of the Chancellor
400 Golden Shore
Long Beach, California 90802
(213) 590-5512

Date: April 1, 1981

To: Presidents

From: Harry Harmon
Executive Vice Chancellor

Subject: Executive Order No. 342
Certification of General Education-Breadth Requirements
by Regionally Accredited Institutions

I am transmitting to you five copies of Executive Order No. 342 which sets forth policies and procedures within which regionally accredited postsecondary institutions may certify that portions of our General Education-Breadth requirements have been completed. This document is the product of extensive discussion and consultation both within the system and with the California Community Colleges. It represents a significant step toward ensuring that our general education objectives are realized for transfer as well as native students.

While the provisions of this Executive Order become effective immediately, there will be an interim procedure for 1981-82 insofar as submission of course lists for that period is concerned. Accredited institutions intending to participate in certification during 1981-82 must submit course lists to each CSUC campus and this office by June 30, 1981. More detailed information will follow.

Distribution:

Vice Presidents, Academic Affairs
Chairs, Local Academic Senates/Councils
Deans, Directors of Admissions
Deans, Undergraduate Studies
Chancellor's Staff

The President has the responsibility for implementing this Executive Order and for maintaining the campus repository and index for all Executive Orders.

Please address any questions regarding this Executive Order to the Vice Chancellor, Academic Affairs.

Attachments

THE CALIFORNIA STATE UNIVERSITY AND COLLEGES
Office of the Chancellor
400 Golden Shore
Long Beach, California 90802

Executive Order:	Executive Order No.: 342
Title:	**Certification of General Education-Breadth Requirements by Regionally Accredited Institutions**
Effective Date:	**April 1, 1981**
Supersedes:	**No Prior Executive Order**

This Executive Order is issued pursuant to Title 5, *California Administrative Code*, Section 40405.3 and Sections 1 and 2 of Chapter III of the Standing Orders of the Board of Trustees of The California State University and Colleges.

I. Purpose

The purpose of this Executive Order is to provide a structure wherein the faculties of other accredited colleges and universities and The California State University and Colleges may meet their respective responsibilities with regard to determining the applicability of courses and examinations to The California State University and Colleges General Education-Breadth requirements. Its provisions are based upon four major premises: 1) that students who conscientiously pursue an educational plan should be able to transfer without unreasonable loss of credit or time; 2) that the faculty of an institution granting the baccalaureate degree are primarily responsible for maintaining the integrity of the degree program and determining when requirements have been met; 3) that the faculty of an institution offering baccalaureate degree level courses are best qualified to judge when those courses or equivalent examinations meet particular objectives; and 4) that there shall ordinarily be a high degree of reciprocity among regionally accredited institutions in the absence of specific indications that such reciprocity is not appropriate.

Taking these premises together as a point of departure, this Executive Order establishes procedures whereby any regionally accredited institution may assure its students that courses or examinations which it offers will be applicable to the General Education-Breadth requirements of The California State University and Colleges.

II. Application

The requirements and procedures of this Executive Order shall apply to students enrolling in Fall 1981 and subsequent terms who have not previously been enrolled continuously at campuses of The California State University and Colleges or the California Community Colleges and shall be limited to certifications to meet the requirements of Title 5, *California Administrative Code*, Section 40405.2 subsections a. through e.

III. Eligibility to Participate

Any institution accredited by one of the six regional accrediting associations which offers the BA or BS or the first two years of such degree programs may participate in General Education-Breadth certification provided it agrees to the following provisions. A participating institution shall:

1. Designate a liaison representative who shall participate in various orientation activities and provide other institutional staff with permanent information.

2. Certify courses or examinations in terms of the objectives set forth in Attachment A to this Executive Order and in such additional statements of objectives as may from time to time be issued by the Chancellor and provide information as follows:

   a. Submit to the Office of the Vice Chancellor, Academic Affairs, CSUC by November 15, 1981 a preliminary list of courses and examinations which the institution believes will meet particular requirements, including the area(s) and objective(s) to which each relates and the number of credits it proposes to assign to such area(s). (See Attachments A and B.) Following an informal review of the list, each participating institution will be advised by January 15, 1982 concerning any courses or area and objective designations which do not appear to be consistent with Board of Trustee General Education-Breadth policy. This review and advice is preliminary and tentative and is intended to assist participating institutions to avoid subsequent challenges arising from misunderstanding or lack of familiarity with the program.

   b. Following the preliminary review and possible revisions based thereon, provide the Office of the Vice Chancellor, Academic Affairs, CSUC and each CSUC campus by April 1, 1982 and annually thereafter one copyable list of all courses and examinations which the institution intends to utilize in certifying completion of General Education-Breadth requirements including the area(s) and objective(s) to which each relates and the number of units applicable to each. (See Attachments A, B, and C.) Upon receipt, this list will be reviewed by a subcommittee of the General Education-Breadth Advisory Committee consisting of four California State University and Colleges faculty and three California Community College faculty which will recommend to the Chancellor courses or examinations which it believes may be subject to challenge (see part V).

   c. Report certification for individual students in a format or formats to be specified. (These will be developed jointly by CSUC and CCC officials responsible for maintaining and processing student records.)

IV. Limitations

Authority to certify shall be limited as follows:

1. No more than 39 semester units may be certified by any campus. In the case of certification by more than one campus no more than 39 semester units need be accepted by the CSUC campus granting the degree.

2. No CSUC campus need accept as certified for a given area more semester units than the minimums set forth in Title 5, Section 40405.2 subdivisions a. through e. and in Executive Order 338.

3. No more than 30 semester units may be certified for areas b. through d. combined, Section 40405.2. In the case of certification by more than one institution no more than a total of 30 semester units need be accepted as certified for areas b. through d. by the CSUC campus granting the degree.

4. Baccalaureate-granting institutions certifying completion of units earned in upper division courses or examinations may certify only those which were completed during or after the term in which the student achieved upper division status (60 or more semester units earned).

5. Courses and examinations used to certify units must be baccalaureate level and have been completed at the certifying institution. However, any participating institution may report completion of courses or examinations taken at other participating institutions provided that all such courses and examinations would be certified by the institution offering them. Such courses and examinations shall be deemed to have been certified.

6. Upon transfer, no student shall be required to complete more units in general education-breadth than the difference between the number certified in accordance with this Executive Order and the total units required by the campus granting the degree.

V. Disputes

In those cases where disagreements arise, concerning any aspect of this certification process, the following steps shall be used to achieve resolution:

1. The chief academic officer or designee of any participating campus/segment shall notify the designated liaison representative of the institution/segment concerned as to the nature of the disagreement and request additional information as appropriate.

2. The chief academic officer or designee of the institution and or segment involved shall discuss the matter informally and seek resolution. Upon request the certifying institution will provide information such as syllabi and sample examinations for any course(s) or examination(s) in question. This informal process shall be completed within 30 days except by mutual agreement that more time is needed due to the complexity of the matter under discussion.

3. If informal efforts to reach agreement are not successful, formal written notice of challenge shall be delivered to the liaison representative concerned and a determination shall be made by an ad hoc review committee convened for that purpose. Such request may be made by the chief academic officer or designee of any campus which is a party to the disagreement or by the Chancellor of The California State University and Colleges or the California Community Colleges or their respective designees. A decision by the review committee shall be final. Committees shall be constituted and shall function as follows:

   a. The Academic Senate, California State University and Colleges and the Academic Senate for the California Community Colleges shall each appoint a panel of 20 faculty representing a range of teaching disciplines, taking into consideration such factors as experience in developing general education policy and curriculum and teaching duties and experience in the respective segments.

b. The Chancellors of each segment or their designees shall jointly select a committee of four or more members with equal numbers drawn from each panel and shall designate one member as Chair.

c. The Chair shall notify officials of the campuses or segments concerned as to the nature of the dispute and request appropriate documentation. The Committee at its discretion may convene to hear oral presentations or may act on the basis of written argument. Meetings shall be open.

d. Except by mutual agreement of the parties, the Committee shall convene within 30 days and shall render a decision no more than 30 days after convening. In the instance of course/examination challenges, it shall be the responsibility of the institution offering the course/examination to demonstrate to the satisfaction of the committee that such course/examination meets the particular objectives as claimed. In the case of failure to reach a decision, a new committee shall be formed. If the second committee does not reach a decision within the prescribed time, the matter will be referred to the General Education-Breadth Advisory Committee for decision.

4. Any course or examination for which a student registers prior to issuance of a formal notice of challenge as described in item 3 above shall be acceptable for certification.

Glenn S. Dumke, Chancellor

Date: April 1, 1981

ATTACHMENT A

In certifying the completion of a portion of the CSUC General Education-Breadth requirements, participating institutions are attesting to the fact that particular courses or examinations have been assessed and found to meet one or more of the following general and specific objectives. Furthermore, certification of a significant portion of the requirements implies that the institution has determined that the total program represents an effort to provide the student with the abilities, knowledge, understanding and appreciation suggested herein as interrelated elements and not as isolated fragments. All courses and examinations used for certification are to be baccalaureate level and be designed for students who possess the basic competence in the English language and mathematical computation which may reasonably be expected of entering college students. Such courses and examinations should whenever appropriate recognize the contributions to knowledge and civilization that have been made by members of various cultural groups and by women.

I. General Objectives

General Education-Breadth requirements are to be designed so that, taken with the major-depth program and electives presented by each baccalaureate candidate, they will assure that graduates have made noteworthy progress toward becoming truly educated persons. Particularly, the purpose of these requirements is to provide means whereby graduates:

A. will have achieved the ability to think clearly and logically, to find and critically examine information, to communicate orally and in writing, and to perform quantitative functions;

B. will have acquired appreciable knowledge about their own bodies and minds, about how human society has developed and how it functions, about the physical world in which they live, about the other forms of life with which they share that world, and about the cultural endeavors and legacies of their civilization;

C. will have come to an understanding and appreciation of the principles, methodologies, value systems, and thought processes employed in human inquiries.

II. Particular Objectives and Requirements

A. A minimum of nine semester units in communication in the English language, to include both oral communication and written communication, and in critical thinking, to include consideration of common fallacies in reasoning.

Instruction approved for fulfillment of the requirement in communication is to be designed to emphasize the content of communication as well as the form and should provide an understanding of the psychological basis and the social significance of communication, including how communication operates in various situations. Applicable course(s) should view communication as the process of human symbolic interaction focusing on the communicative process from the rhetorical perspective: reasoning and advocacy, organization, accuracy; the discovery, critical evaluation and reporting of information; reading and listening effectively as well as speaking and writing. This must include active participation and practice in written communication and oral communication.

Instruction in critical thinking is to be designed to achieve an understanding of the relationship of language to logic, which should lead to the ability to analyze, criticize, and advocate ideas, to reason inductively and deductively, and to reach factual or judgmental conclusions based on sound inferences drawn from unambiguous statements of knowledge or belief. The minimal competence to be expected at the successful conclusion of instruction in critical thinking should be the ability to distinguish fact from judgment, belief from knowledge, and skills in elementary inductive and deductive processes, including an understanding of the formal and informal fallacies of language and thought.

B. A minimum of 12 semester units to include inquiry into the physical universe and its life forms, with some immediate participation in laboratory activity, and into mathematical concepts and quantitative reasoning and their applications.

Instruction approved for the fulfillment of this requirement is intended to impart knowledge of the facts and principles which form the foundations of living and non-living systems. Such studies should promote understanding and appreciation of the methodologies of science as investigative tools, the limitations of scientific endeavors: namely, what is the evidence and how was it derived? In addition, particular attention should be given to the influence which the acquisition of scientific knowledge has had on the development of the world's civilizations, not only as expressed in the past but also in present times. The nature and extent of laboratory experience is to be determined by each campus through its established curricular procedures. In specifying inquiry into mathematical concepts and quantitative reasoning and their application, the intention is not to imply merely basic computational skills, but to encourage as well the understanding of basic mathematical concepts.

C. A minimum of 12 semester units among the arts, literature, philosophy and foreign languages.

Instruction approved for the fulfillment of this requirement should cultivate intellect, imagination, sensibility and sensitivity. It is meant in part to encourage students to respond subjectively as well as objectively to experience and to develop a sense of the integrity of emotional and intellectual response. Students should be motivated to cultivate and refine their affective as well as cognitive and physical faculties through studying great works of the human imagination, which could include active participation in individual aesthetic, creative experience. Equally important is the intellectual examination of the subjective response, thereby increasing awareness and appreciation in the traditional humanistic disciplines such as art, dance, drama, literature and music. The requirement should result in the student's better understanding of the interrelationship between the creative arts, the humanities and self. Studies in these areas should include exposure to both Western cultures and non-Western cultures.

Foreign language courses may be included in this requirement because of their implications for cultures both in their linguistic structures and in their use in literature; but foreign language courses which are approved to meet a portion of this requirement are to contain a cultural component and not be solely skills acquisition courses. Campus provisions for fulfillment of this requirement must include a reasonable distribution among the categories specified as opposed to the completion of the entire number of units required in one category.

D. A minimum of twelve semester units dealing with human social, political, and economic institutions and behavior and their historical background.

Instruction approved for fulfillment of this requirement should reflect the fact that human social, political and economic institutions and behavior are inextricably interwoven. Problems and issues in these areas should be examined in their contemporary as well as historical setting, including both Western and non-Western contexts. Campus provisions for fulfillment of this requirement must include a reasonable distribution among the categories specified as opposed to completion of the entire number of units required in one category.

E. A minimum of three semester units in study designed to equip human beings for lifelong understanding and development of themselves as integrated physiological and psychological entities.

Instruction approved for fulfillment of this requirement should facilitate understanding of the human being as an integrated physiological, social, and psychological organism. Courses developed to meet this requirement are intended to include selective consideration of such matters as human behavior, sexuality, nutrition, health, stress, key relationships of humankind to the social and physical environment, and implications of death and dying. Physical activity could be included, provided that it is an integral part of the study described herein.

ATTACHMENT B

SPECIFIC AREA AND OBJECTIVE CERTIFICATION DESIGNATORS

(Refer to Attachment A for full description of objectives.)

Area A:	Communication in the English Language and Critical Thinking	
	Oral Communication	A1
	Written Communication	A2
	Critical Thinking	A3
Area B:	Physical Universe and Its Life Forms	
	Physical Universe	B1
	Life Forms	B2
	Laboratory Activity	B3
	Mathematical Concepts, Quantitative Reasoning and Applications	B4
Area C:	Arts, Literature, Philosophy and Foreign Language	
	Arts (art, dance, drama, music)	C1
	Literature	C2
	Philosophy	C3
	Foreign Language	C4
	Active Participation	C5
	Western Cultures	C6
	Non-Western Cultures	C7
Area D:	Social, Political and Economic Institutions	
	Social Institutions	D1
	Political Institutions	D2
	Economic Institutions	D3
	Contemporary Setting	D4
	Historical Setting	D5
	Western Context	D6
	Non-Western Context	D7
Area E:	Lifelong Understanding and Self-Development	
	Integrated Organism	E1
	Activity	E2

Executive Order No.: 342

Illustrative List

Art 100	Intro to Art Processes	C1, C5 (3)
Biol 101	General Biology	B2, B3 (4)
Bus 100	Fndns of Amer. Enterprise	D3 (3)
Bus 223	Computer Applications	B4 (3)
ChS100	Chicano Culture	D1, D2, D3, D5 (3)
CL 112	Classical Civilization	C1, C2 (3)
Engl 155	Freshman Comp	A2, A3 (3)
Hlth 120	Hlth and Society.	E1 (2)
Hist 100AB	Modern Civilizations	C1, C2, C3 (3) and D1, D2, D5, D6 (3)
Hum 101-102	Intro to Humanities	C1, C2, C3, C6 (6)
Music 104	Music Involvement	C1, C5 (3)
PhyS 150	Principles of Phys. Sci.	B1, B4 (3)
Psy 245	Psychology of Prejudice	A3, D1, E1 (3)
Spch 225	Strategies of Argument	A1, A3 (3)
CLEP Subject Examination Elementary Statistics (1978) ETS, Princeton, N.J.		B4 (3)
CSUC English Equivalency Examination		A2 (3)

NOTES:

1. A course or examination may apply to more than one area.
2. A course or examination may apply to one area *or* another.
3. The unit credit assigned to a particular area or areas may not be the entire credit value of the course or examination.

Executive Order No.: 342

ATTACHMENT C

FORMAT FOR CERTIFIABLE COURSE/EXAMINATION LISTS

INSTITUTION NAME AND MAILING ADDRESS:

LIAISON DESIGNEE, NAME AND PHONE:

EFFECTIVE FROM _____ TO _____
(Give specific dates or indicate "until revoked.")

COURSES:

Prefix (Dept.) No.	Catalog Title	Areas and Objectives	Units (Sem. or Qtr.)
(See Attachment A for illustrative list. Include description as attachment if course does not appear in current catalog.)			

EXAMINATIONS:

(Give complete Title of examination, cut-off score where appropriate, form, year, publisher, and other identifying information.)

The foregoing courses (and examinations) have been reviewed by appropriate authorities at this institution and have been determined to meet the objectives of The California State University and Colleges General Education-Breadth Program as specified.

Signed _____
Chief Executive Officer

Date _____

APPENDIX 8

ELM Performance Levels by Campus, FTTs

	Number of FTTs	Number Passing	Percent Passing
Bakersfield	240	84	35.0
Chico	867	399	46.0
Dominguez Hills	436	138	31.7
Fresno	958	462	48.2
Fullerton	1,491	813	54.5
Hayward	854	358	41.9
Humboldt	472	223	47.2
Long Beach	1,884	930	49.4
Los Angeles	605	264	43.6
Northridge	1,768	902	51.0
Pomona	1,301	659	50.7
Sacramento	1,021	527	51.6
San Bernardino	414	115	27.8
San Diego	1,896	925	48.8
San Francisco	2,803	1,112	39.7
San Jose	1,653	835	50.5
San Luis Obispo	746	414	55.5
Sonoma	571	175	30.6
Stanislaus	277	97	35.0
No specified campus*	99	49	49.5
Total	20,356	9,481	46.6

ELM Performance Levels by Campus, FTFs-FTTs

	Number of FTFs-FTTs	Number Passing	Percent Passing
Bakersfield	128	52	40.6
Chico	705	336	47.7
Dominguez Hills	198	76	38.4
Fresno	734	381	51.9
Fullerton	935	557	59.6
Hayward	477	225	47.2
Humboldt	288	145	50.3
Long Beach	1,442	767	53.2
Los Angeles	415	188	45.3
Northridge	1,142	602	52.7
Pomona	895	499	55.8
Sacramento	789	435	55.1
San Bernardino	216	80	37.0
San Diego	1,221	664	54.4
San Francisco	965	450	46.6
San Jose	893	541	60.6
San Luis Obispo	553	271	49.0
Sonoma	200	65	32.5
Stanislaus	159	65	40.9
Total	12,355	6,449	52.2

*Students are asked to indicate campus where they plan to enroll.

APPENDIX 9

DISTRIBUTION OF ELM TOTAL SCORES AMONG FIRST-TIME TEST TAKERS (FTTs) 1983/84 TESTING YEAR

Limits			All FTTs			First-Time Freshmen (FTFs)		
Lower		Upper	Absolute Frequency	Percent	Cum Percent	Absolute Frequency	Percent	Cum Percent
0	TO	40	4	.02	.02	2	.02	.02
5	TO	9	108	53	.55	47	.38	.40
10	TO	14	647	3.18	3.73	285	2.31	2.70
15	TO	19	1,422	6.99	10.71	660	5.34	8.05
20	TO	22	1,197	5.88	16.59	589	4.77	12.81
23	TO	25	1,353	6.65	23.24	686	5.55	18.37
26	TO	28	1,469	7.22	30.46	841	6.81	25.17
29	TO	31	1,485	7.30	37.75	840	6.81	31.98
32	TO	34	1,580	7.76	45.51	958	7.75	39.73
35	TO	37	1,610	7.91	53.42	1,000	8.09	47.83
38	TO	40	1,657	8.14	61.56	1,081	8.75	56.58
41	TO	43	1,720	8.45	70.01	1,184	9.58	66.16
44	TO	46	1,548	7.60	77.62	1,052	8.51	74.67
47	TO	49	1,501	7.37	84.99	1,048	8.48	83.16
50	TO	52	1,337	6.57	91.56	940	7.61	90.76
53	TO	55	1,022	5.02	96.58	719	5.82	96.58
56	TO	60	696	3.42	100.00	422	3.42	100.00
			20,356	100.00	100.00	12,355	100.00	100.00
% Passing				46.58			52.17	
Mean				35.712			37.239	
Median				36.701			38.745	
Standard Dev.				12.095			11.646	

APPENDIX 10

ELM PERFORMANCE BY ETHNIC BACKGROUND, FTF-FTTs 1983-84 TESTING YEAR

	Total FTF-FTTs	Number Passing	Percent Passing
American Indian	92	29	31.5
Asian	1,316	1,008	76.6
Black Non-Hispanic	993	260	26.2
Mexican American	1,161	484	41.7
Filipino	417	265	63.5
Other Hispanic	425	185	43.5
Pacific Islander	61	34	55.7
White Non-Hispanic	7,087	3,756	53.0
Other Responses	299	170	56.9
Decline to State	295	152	51.5
No Response	209	103	49.3
All Groups	12,355	6,446	52.2

ELM PERFORMANCE BY SEX AND ETHNIC GROUPS, FTF-FTTS 1983-84 TESTING YEAR

	Male			Female		
	Total FTF-FTTs	Number Passing	Percent Passing	Total FTF-FTTs	Number Passing	Percent Passing
American Indian	34	17	50.0	58	12	20.7
Asian	542	442	81.5	774	566	73.1
Black Non-Hispanic	315	95	30.2	678	165	24.3
Mexican American	507	239	47.1	654	245	37.5
Filipino	157	112	71.3	260	153	58.8
Other Hispanic	188	98	42.1	237	87	36.7
Pacific Islander	24	17	70.8	37	17	45.9
White Non-Hispanic	2,547	1,508	59.2	4,540	2,248	49.5
Decline to State	117	66	56.4	178	86	48.3
No Response	91	49	53.8	118	54	45.8
All Groups	4,625	2,706	58.5	7,730	3,740	48.4

THE CALIFORNIA STATE UNIVERSITY
Office of the Chancellor
400 Golden Shore
Long Beach, California 90802
(213) 590-5708

Code: API 83-12

Date: December 22, 1983

To: Presidents

From: William E. Vandament
Acting Provost and Vice Chancellor,
Academic Affairs

Subject: Evaluation of the Entry Level Mathematics Examination - Request for Proposals

The ELM Exam Task Force has agreed that systematic evaluation is a major component of any successful testing program. Accordingly, a ten-member ELM Evaluation Committee met during the summer 1983 to prepare an evaluation design for campus and systemwide studies. The product of their work is enclosed for your review (Attachment A). It has been approved by the Task Force.

The document addresses the following issues:

1. Goals and Assumptions of the Evaluation Design
2. ELM Exam Program Areas of Study
3. Data Sources
4. Timelines
5. Resource Implications

The purpose of this memo is twofold. First, the Evaluation Committee urged that ELM coordinators agree to serve in the added capacity of campus liaisons for monitoring ELM evaluation activities and data. Campus coordinators for ELM (Attachment B) are asked to notify this office if you anticipate any problems with this arrangement.

Secondly, interested faculty and administrators are asked to develop campus evaluation designs which specifically address one or more of the items on pages 2-3 of the attached document. Notice that several types of data (student, test, course, survey) are implied by the design, and that many

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Distribution: Attention: Deans, Admissions and Records
Testing Directors
Institutional Research Directors
Learning Assistance Center Directors
Directors, Educational Opportunity Program and Student Affirmative Action
Chairs, Mathematics Departments
Entry Level Mathematics Coordinators

data sources (ERSS, ETS, CDPS, math department files, transcripts) may be used. Measuring outcomes which require campus transcript studies are of special concern given the manual processing involved.

Most of the research agenda suggests "changes" over time - in the CSU applicant pool, in student behavior, and in the curriculum. Studies which envision time-series and longitudinal designs are therefore essential. Evaluations of campus remediation programs are also of special interest.

Please circulate this request for proposals among faculty and administrators on your campus who may be interested in submitting an evaluation research design to this office for review. Dr. Stephen Daigle of the Academic Program Improvement staff is prepared to assist such individuals in developing and implementing appropriate research strategies. He may be reached at ATSS 8-635-5714 or (213) 590-5714.

A modest amount of grant money is available for assigned time, clerical and student assistance, and supplies and materials not otherwise available through normal campus and department support, subject to campus approval. Proposals may range up to $1,000. The research design should indicate the items being tested, describe the research procedure, identify data sources, techniques of analysis, timelines, and budgetary requirements. The proposal should be no more than five pages, single-spaced, including attachments; five copies should be sent to Dr. Linda Bunnell Jones, Associate Dean, Academic Program Improvement, Office of the Chancellor, 400 Golden Shore, Suite 314, Long Beach, California 90802-4275. There is no limit on the number of proposals which a campus may submit.

Although the research design may extend for several semesters, funding for the initial phase of the research will end June 30, 1984. Additional funding may be available during the next fiscal year. Proposals must be postmarked by February 15, 1984. Awards will be announced on March 1 following the appropriate reviews. Please use Attachment C as a cover page, complete the budget page (Attachment D), and submit the proposal directly to the office of Academic Program Improvement.

WEV:je

Attachments

cc: Vice Presidents, Academic Affairs
Deans of Student Services
Academic Senate Chairs
Academic Program Improvement Liaisons
Entry Level Mathematics Task Force
Entry Level Mathematics Evaluation Committee

EVALUATION DESIGN FOR THE CSU ELEMENTARY LEVEL MATHEMATICS EXAM

GOALS AND ASSUMPTIONS OF THE EVALUATION DESIGN

The goals of a systematic evaluation of the ELM exam are:

1. To test a series of specific outcomes related to:

   a. Long-Term Changes in the CSU Applicant Pool
   b. Changes in CSU Student Behavior
   c. CSU Curriculum Changes and Reduction in Need for Remediation

2. To provide data which might be useful for future test development and administration.

3. To provide a baseline set of descriptive, quantitative data for measuring student performance on the exam over time.

4. To establish campus data collection procedures required for systemwide analysis of the exam.

5. To encourage campus evaluations of programs related to the ELM exam (e.g., remediation efforts).

Several assumptions guided the deliberations of the Evaluation Committee. Among other things, it was agreed that:

1. Although program outcomes are the major concern of the Committee, issues of test validity and reliability should continue to be examined to the extent that time and resources permit. Evaluation and test development are related although analytically distinct activities. The ELM Test Development Committee will continue the process of item analysis.

2. The attribution of specific causal properties to the ELM exam is not feasible. The independent effects of the exam simply cannot be meaningfully isolated from a host of other developments designed to improve the quantitative skills of students. Further, experimental and/or longitudinal designs are both difficult and expensive to administer, and will be attempted, if at all, on very limited populations.

3. The evaluation should be careful to distinguish between the long-term and short-term effects of the exam since they may be quite different in direction and degree. For example, remediation programs may increase in numbers and significance in the short run, but presumably will be less needed over time. Similarly, the initial effects on groups of under-prepared students may be to slow their academic progress somewhat, but the long-term consequences of the exam will be improvement of academic performance for all students.

ELM EXAM PROGRAM AREAS OF STUDY

The Committee sought a balance between identifying hypotheses which were narrow yet easily measurable on the one hand, and ones which were more global yet less easily measurable on the other. Moreover, while the main emphasis is on generating quantitative data for the evaluation, the Committee agreed that evidence of a qualitative nature should be considered as well. Accordingly, the following categories seemed to suggest reasonable areas of study:

A. Long-Term Changes in the CSU Applicant Pool

1. There will be an increase in the number of years of college preparatory mathematics taken in high school by new students. These data are available from Educational Testing Services (ETS) as self-reported from students who have taken the ELM test. A limited campus study of student transcripts is another source of data.

2. Student performance in high school math courses will improve over time. Here SAT-M scores of CSU-bound students as a function of time will be useful. Self-reported grades of students who have taken the ELM test are available. A limited transcript study will also provide data for this objective.

3. Improvements will be observed in the high school mathematics curriculum. Content of sampled high school math curriculum will be measured against the "Statement on Competencies in College Preparatory English and Mathematics" and the "CSU Guidelines for Curriculum for the Two-Year Mathematics Requirement." California Math Council publications on high school math curriculum will be examined for changes. Information will be collected that shows changes in high school math textbook selection. Changes may also be observed in those assigned to teach high school mathematics.

4. The percentage of students passing the ELM exam will improve over time since the level of difficulty of the test will be held constant. However, changes in admissions requirements should be examined for impact.

B. Changes in CSU Student Behavior

1. Retention levels will increase in the university generally and in general education quantitative courses in particular. University-level data are available from systemwide files; course-level data will be collected from individual departments offering these courses.

2. Student performance in general education quantitative courses will improve over time. One indicator of such improvement will be an improvement of student grades gathered from departments; a second source of data is a survey and interview of faculty from quantitative areas.

3. Demographic composition of the overall student population may reflect the new quantitative skill levels, particularly for women and ethnic minority students. Campus analyses of course data will be conjoined with ERSS data to examine this question.

4. Enrollment shifts may be observed within degree majors toward more quantitative courses, especially for women and minorities. Campus data and ERSS represent sources for these data.

C. CSU Curriculum Changes and Reduction in Need for Remediation

1. Changes in academic standards will be observed, i.e., the actual level and content of quantitative courses will improve. A survey of chairs in selected disciplines will provide information on faculty behavior in teaching quantitative courses. Cooperation of the CSU General Education Advisory Committee will be sought to document changes.

2. The number of remedial courses and programs will increase initially, and then decline. Mandated CSU data collected for the CPEC remediation study will be examined. Studies using CDPS course data together with department surveys will indicate changes.

3. The number of quantitatively oriented courses and programs will increase together with enrollments in such courses. CDPS files will provide these data.

4. Campus evaluation studies will identify and implement model remediation programs that are both effective and cost-efficient. Some of these studies will be funded by the Chancellor's Office.

D. Test Validity

1. Data elements provided by ETS will show positive correlations with other indicators of math competency in student files. ETS and ERSS files will be merged for this.

2. Performance on the ELM exam will be positively related to student grades in both remedial and credit quantitative courses. Campuses will be urged to conduct studies to provide these data.

E. Process Objectives

1. The level of activity related to administration of the ELM exam will vary by campus; descriptive data will be collected to reflect these differences.

2. The major sources of data will be ETS and interviews with campus administrators. The type of information which will be sought will include data on physical test administration, numbers of students taking ELM, pass rate, exemptions, retakes, compliance level, enforcement policies, frequency of demand test, and level of information distribution.

DATA SOURCES, TIMELINES, AND COSTS

Several strategies are available for collecting and analyzing the data implied by these areas of study. Essentially, they fall into four categories:

1. Correlations between data elements in the ETS and ERSS files.

2. Surveys of and/or interviews with selected administrators on each campus.

3. Faculty surveys and/or interviews.

4. Experimental and/or longitudinal designs of small populations proposed and carried out by individual campuses in cooperation with the Chancellor's Office.

The data processing requirements of the evaluation will be satisfied from several sources. First, ETS will routinely provide frequency data and summary statistics for each administration of the exam. Second, the Chancellor's Office, i.e., Office of Analytical Studies or the Division of Information Systems will perform selected analysis of test results through mergers of ETS files with CSU student data bases. Third, the individual campuses will be asked to provide reports and summary data as part of their own evaluation activities.

The Office of Academic Program Improvement will assume primary responsibility for evaluation design, coordination, and report preparation. This arrangement will provide a focal point for data analysis and insure that a series of timely reports continue to be issued to campus administrators on the status of the ELM exam.

The issues of "process" or implementation objectives and of test validity are relatively short-term in nature, i.e., they can probably be adequately addressed within the first two years of the ELM exam. The objectives related to "changes" in the applicant pool, student behavior, and the curriculum will require more time before meaningful results can be reported. Below is a

list of evaluation activities for the first two years which together should serve to forge some integrated conclusions about the ELM exam:

Fall 1983

1. Establish campus liaisons for monitoring ELM evaluation activities and data. ELM coordinators will be asked to serve in this capacity.
2. Provide campus administrators with a list of standardized data elements to be reported to the Chancellor's Office.
3. Provide campuses copies of the ELM evaluation design in a formal RFP package.
4. A committee reviews the campus evaluation designs and makes awards to campuses.

Spring-Summer 1984

1. Collect survey data from campus administrators and conduct interviews on selected campuses or at a central site.
2. Maintain contact with campus evaluation projects and receive interim reports in summer 1984.
3. Produce the first annual report on the data and activities to date.

Fall 1984

1. Establish campus liaisons for monitoring ELM evaluation activities and data.
2. Provide campus administrators with a list of standardized data elements to be reported to the Chancellor's Office.
3. Monitor campus projects.

Spring-Summer 1985

1. Collect survey data from campus administrators and conduct interviews on selected campuses or at a central site.
2. Mail out surveys to CSU faculty and examine the extent to which such data are being collected by high school administrators.
3. Conduct interviews with selected CSU faculty.
4. Receive second reports of campus evaluation projects.
5. Produce a second annual evaluation report.

1985-86 Academic Year

Produce a final comprehensive report on the ELM evaluation.

SUMMARY OF RESOURCE IMPLICATIONS

The resource demands of the proposed ELM evaluation appear to be relatively modest with the possible exception of involvement by individual campuses. The ETS data will be supplied under contracts

already in existence. The participation of staff from OAS and API in the analysis of ELM data will continue although additional resources will be required to implement the full design described above. Surveys and site visits, while logistically demanding, are efficient means for collecting large quantities of information. Thus, the one item which may have the most serious costs attached is campus involvement in evaluation activities. However, such costs can be minimized by a) insisting on designs which are narrowly focused, technically precise, and limited to small populations; and b) establishing limits on the number and amount of grants available in the ELM evaluation competition. Of course, campuses will also be encouraged to conduct independent studies and to report their findings to the Chancellor's Office.

SD:cpa
0181p

Prepared by Stephen L. Daigle

ATTACHMENT B

API 83-12

CAMPUS COORDINATORS FOR THE
ENTRY LEVEL MATHEMATICS TEST

Appendix 11

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Professor of Mathematics
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Viji Sundar
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6/83

ATTACHMENT C
API 83-12

Office use only

Appendix 11

ACADEMIC PROGRAM IMPROVEMENT
ENTRY LEVEL MATHEMATICS EVALUATION PROJECT

Evaluation project for: _____
Campus

Abstract:

Project directed by:

_____
Name(s)

_____
Title(s)

_____
Department(s)

_____
Telephone: Office/Message

Amount requested: $_____

Approval by President or Designee:

_____
Signature

_____
Date

PROJECT BUDGET

Personal Services	Hours or % of time	Dollar Total
Faculty or Administrative assigned time (based on rate of Asst. Prof., Step III)	_____	_____
Clerical Assistance	_____	_____
Student Assistants	_____	_____
Other _____	_____	_____
Total, Personal Services		_____

Operating Expenses	
Supplies	_____
Telephone	_____
Postage	_____
Printing	_____
Other _____	_____
Total, Operating Expenses	_____

TOTAL REQUESTED: $_____

Dear Student:

Appendix 12

The information in this form is being collected in order to study the effects of various forms of remediation on the ELM pass rate. Your voluntary participation in this research is being solicited in order to help the university better serve the needs of its students. Identifying information has been requested in order to make subsequent follow-up studies possible. Your responses will be held in the strictest professional confidence.

Please use a number 2 pencil. On your answer sheet please fill in your name, sex and birthdate in the spaces provided. Darken the appropriate circles for each of these items. In the area designated for identification number please supply your social security number and darken the appropriate circles.

Then answer each of the following items by darkening the appropriate circle on the answer sheet which corresponds to the number of the item.

1) Name of High School Attended

(A) Gardena High (B) Carson High (C) Banning High (D) Narbonne High (E) San Pedro High

(F) Compton High (G) Locke Senior High (H) Rolling Hills High (I) West High (J) Other

2) Name of Prior College Attended

(A) None (B) El Camino (C) L.A. Harbor (D) CSULB (E) L.A. Southwest

(F) Compton CC (G) Long Beach CC (H) West L.A. CC (I) UCLA (J) Other

3) Name of College Planning to Attend

(A) CSUDH (B) CSULB (C) CSU Northridge (D) UCLA (E) USC

(F) CSU L.A. (G) CSU Pomona (H) Other CSU (I) Other UC (J) Other

4) How many times have you taken the ELM prior to this administration?

(A) zero (B) one (C) two (D) three (E) four (F) five

5) a) Which <u>one</u> of the following <u>best</u> indicates how you prepared to take the ELM exam at this administration?

(A) Took MAT 006 at CSUDH (B) Took MAT 002 at CSUDH (C) Took MAT 004 at CSUDH

(D) Tutoring from Learning Assistance Center

(E) Private Tutor (F) Studied on my own (G) Did nothing in particular to prepare

6) How many hours per week did you study in preparation for the ELM?

(A) 0 (B) 1-3 (C) 4-6 (D) 7-9 (E) 10-12 (F) 13-15 (G) 15-20 (H) more than 20

7) How much formal education did your father receive? (Indicate highest level achieved)

(A) Did not finish high school (B) High school graduate (C) Some college (D) Received Bachelor's degree
(E) Some graduate work (F) Graduate Degree

8) How much formal education did your mother receive? (Indicate highest level achieved)

(A) Did not finish high school (B) High school graduate (C) Some college (D) Received Bachelor's degree
(E) Some graduate work (F) Graduate Degree

9) Are you the first one in your immediate family to attend college?

(A) yes (B) no

10) Marital status

(A) Not presently married (B) Married, living with spouse (C) Married, not living with spouse

11) What is your best estimate of your family's total income last year? Consider annual income from all sources before taxes.

(A) under $12,000 (B) $12,000 - $17,999 (C) $18,000 - $29,999 (D) $30,000 - $49,999 (E) over $50,000

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For each of the statements (12-21) rate your level of agreement according to the following:

(A) Strongly Agree (C) Undecided
(B) Agree (D) Disagree
(E) Strongly disagree

12) It wouldn't bother me at all to take more math courses.

13) I have usually been at ease during math tests.

14) I have usually been at ease in math courses.

15) I usually don't worry about my ability to solve math problems.

16) I almost never get uptight while taking math tests.

17) I get really uptight during math tests.

18) I get a sinking feeling when I think of trying hard math problems.

19) My mind goes blank and I am unable to think clearly when working mathematics.

20) Mathematics makes me feel uncomfortable and nervous.

21) Mathematics makes me feel uneasy and confused.

22) What is your major or probable major field of study?

(A) Computer Science (B) Business Administration (C) Liberal Studies (D) Medical Technology
(E) Psychology (F) Biology (G) Business Info Systems (H) Other (I) Undecided

23) What career are you planning?

(A) Computer Scientist or Programmer (B) Teacher (C) Psychologist (D) Doctor or Dentist
(E) Business Manager/ Administrator (F) Accountant (G) Communications (H) Other (I) Undecided

24) Indicate which of the following was the highest level high school math course that you have taken?

(A) Algebra I (B) Geometry (C) Algebra II (D) Trigonometry (E) Calculus (F) Other

25) What was your grade in the high school course mentioned in Question 24?

(A) A (B) B (C) C (D) D (E) F

26) How many years has it been since you took the course mentioned in Question 24?

(A) Just recently (B) 1 year (C) 2 years (D) 3 -5 years (E) 6 - 10 years
(F) 11 - 20 years (G) more than 20 years

27) Indicate the highest level college math course that you have taken.

(A) Review Algebra (B) College Algebra (C) Precalc/Trig (D) Statistics (E) Calculus (F) Other

28) What was your grade in the course mentioned in Question 27?

(A) A (B) B (C) C (D) D (E) F

29) How many years has it been since you took the course mentioned in Question 27?

(A) Just recently (B) 1 year (C) 2 years (D) 3-5 years (E) 6 -10 years

(F) 11-20 years (G) more than 20 years

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ENTRY LEVEL MATHEMATICS (ELM) DATA BASE ELEMENTS

*RECORD 1 (QUESTIONNAIRE DATA)
SEE THE ATTACHED QUESTIONNAIRE FOR THE VALUE LABELS

FIELD DESCRIPTION	SIZE	COLUMNS
NAME	20	1-20
BIRTHDATE	6	21-25
SOCIAL SECURITY NUMBER	9	26-34
CODE (FOR FUTURE USE)	6	35-40
GRADE LEVEL	2	41-42
SEX	1	43
Q1 THROUGH Q30	1	44-73

*RECORD 2 (STUDENT MASTER FILE EXTRACT)

FIELD DESCRIPTION	SIZE	COLUMNS
ZIPCODE	5	1-5
TRANSFER UNITS EARNED	4	6-9
TRANSFER GPA	3	10-12
CSUDH UNITS EARNED	4	13-16
CSUDH GPA	3	17-19
TOTAL UNITS EARNED	4	20-23
TOTAL GPA	3	24-26
SEX	1	27
BIRTHDATE	6	28-33
HEGIS MAJOR	5	34-38
CLASS LEVEL AT ENTRY	1	39
CLASS LEVEL CURRENT	1	40
DEGREE OBJECTIVE	1	41
ENROLL STATUS	1	42
RESIDENCE CODE	4	43-46
BASIS OF ADMISSION	1	47
LAST INSTITUTION	6	48-53
HIGH SCHOOL GRAD YEAR	2	54-55
HIGH SCHOOL GPA	3	56-58
TEST INDICATOR	1	59
TEST SCORES	10	60-69
CITIZENSHIP STATUS	1	70
ETHNIC CODE	1	71
EOP FLAG	1	72
PROBATION FLAG	1	73
LAST QUARTER ATTENDED	3	74-76
CURRENT UNITS ATTEMPTED	9	77-85
QUARTER ADMITTED	3	86-88
HANDICAP FLAG	1	89
CURRENT DAY UNITS	3	90-92
CURRENT NIGHT UNITS	3	93-95
ENGLISH SCORES	24	96-119

*RECORD 3 (ELM RESULTS)

SUBJECT TO ELM	1	1
ELM TEST DATE 1	6	2-7
ELM SCORE	12	8-19
ELM TEST DATE 2	6	20-25
ELM SCORE	12	26-37
ELM TEST DATE 3	6	38-43
ELM SCORE	12	44-55
ELM TEST DATE 4	6	56-61
ELM SCORE	12	62-73
ELM TEST DATE 5	6	74-79
ELM SCORE	12	80-91

*RECORD 4 (COURSE HISTORY)

FIELD DESCRIPTION	SIZE	COLUMNS
QUARTER	3	1-3
COURSE	5	4-8
PASS/FAIL	1	9
QUARTER	3	10-12
COURSE	5	13-17
PASS/FAIL	1	18
QUARTER	3	19-21
COURSE	5	22-26
PASS/FAIL	1	27
QUARTER	3	28-30
COURSE	5	31-35
PASS/FAIL	1	36
QUARTER	3	37-39
COURSE	5	40-44
PASS/FAIL	1	45
CBEST MATH SCORE	2	46-47
REMEDIATION TYPE	1	48
NUMBER OF VISITS	2	49-50